2021-09

A SURGE ON THE HORIZON: IMPROVING U.S. FORESIGHT CAPACITY TO ANTICIPATE MASS MIGRATIONS

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THESIS

A SURGE ON THE HORIZON: IMPROVING U.S. FORESIGHT CAPACITY TO ANTICIPATE MASS MIGRATIONS

by

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September 2021

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REPORT DOCUMENTATION PAGE	*Form Approved OMB No. 0704-0188*

1. AGENCY USE ONLY *(Leave blank)*	**2. REPORT DATE** September 2021	**3. REPORT TYPE AND DATES COVERED** Master's thesis

4. TITLE AND SUBTITLE
A SURGE ON THE HORIZON: IMPROVING U.S. FORESIGHT CAPACITY TO ANTICIPATE MASS MIGRATIONS

5. FUNDING NUMBERS

6. AUTHOR(S) Katie Martin Riesner

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Naval Postgraduate School
Monterey, CA 93943-5000

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
N/A

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release. Distribution is unlimited.

12b. DISTRIBUTION CODE
A

13. ABSTRACT (maximum 200 words)

Mass migrations at the southwest border are nothing new, but surges in unaccompanied minors and family units crossing the border in short periods are increasingly overwhelming the U.S. government's capacity to respond, resulting in humanitarian, legal, and financial consequences. Due to the complex motivations for migrating, U.S. immigration authorities currently lack the ability to anticipate mass-migration events, making it difficult to prepare for them. This thesis poses the question of how the U.S. government can improve its foresight capacity to anticipate and manage mass-migration events. This thesis does not model mass-migration events, but rather demonstrates that such work is feasible and necessary. This analysis uses Maslow's hierarchy of needs as a framework to organize the reasons for migration and offers ways to quantify such factors. Next, it explores available technologies that could increase the accuracy of migration forecasting and various modeling methods that could be used to synthesize such data. This thesis then examines strategic foresight units across governments, identifying best practices that could be used to build out the capacity to conduct strategic forecasting within the mass-migration sphere. Ultimately, this thesis finds that strategic foresight vis-à-vis mass migration is possible and recommends creating a strategic foresight unit tasked with anticipating mass-migration flows.

14. SUBJECT TERMS
immigration, mass migration, foresight, future planning, strategic foresight, migration, southwest border

15. NUMBER OF PAGES
147

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	**18. SECURITY CLASSIFICATION OF THIS PAGE**	**19. SECURITY CLASSIFICATION OF ABSTRACT**	**20. LIMITATION OF ABSTRACT**
Unclassified	Unclassified	Unclassified	UU

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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A SURGE ON THE HORIZON: IMPROVING U.S. FORESIGHT CAPACITY TO ANTICIPATE MASS MIGRATIONS

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Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
September 2021**

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ABSTRACT

Mass migrations at the southwest border are nothing new, but surges in unaccompanied minors and family units crossing the border in short periods are increasingly overwhelming the U.S. government's capacity to respond, resulting in humanitarian, legal, and financial consequences. Due to the complex motivations for migrating, U.S. immigration authorities currently lack the ability to anticipate mass-migration events, making it difficult to prepare for them. This thesis poses the question of how the U.S. government can improve its foresight capacity to anticipate and manage mass-migration events. This thesis does not model mass-migration events, but rather demonstrates that such work is feasible and necessary. This analysis uses Maslow's hierarchy of needs as a framework to organize the reasons for migration and offers ways to quantify such factors. Next, it explores available technologies that could increase the accuracy of migration forecasting and various modeling methods that could be used to synthesize such data. This thesis then examines strategic foresight units across governments, identifying best practices that could be used to build out the capacity to conduct strategic forecasting within the mass-migration sphere. Ultimately, this thesis finds that strategic foresight vis-à-vis mass migration is possible and recommends creating a strategic foresight unit tasked with anticipating mass-migration flows.

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LIST OF ACRONYMS AND ABBREVIATIONS

BITMAP	Biometric Identification Transnational Migration Alert Program
CBP	Customs and Border Protection
CIS	Citizenship and Immigration Services
DACA	Deferred Action for Childhood Arrivals
DARPA	Defense Advanced Research Projects Agency
DHS	Department of Homeland Security
ERO	Enforcement and Removal Operations
FEMA	Federal Emergency Management Agency
ICE	Immigration and Customs Enforcement
INS	Immigration and Naturalization Service
ORR	Office of Refugee Resettlement
UNHCR	United Nations High Commissioner for Refugees

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EXECUTIVE SUMMARY

Mass migrations arriving at the southwest border of the United States are increasingly overwhelming the U.S. government's ability to respond. When these events overwhelm U.S. immigration authorities, they can exacerbate security vulnerabilities. For example, gang members, criminals, terrorists, and foreign fugitives can all exploit the porous southwest border, especially during a mass-migration event when resources are stretched thin. This thesis advocates building the capacity for the U.S. government to conduct strategic foresight work to anticipate mass-migration flows before they occur. It argues that such foresight is not only feasible but also necessary to prevent future security threats, financial costs, and humanitarian crises along the southwest border.

The goal of strategic foresight work "is to create an evidence base to lead strategic planning."[1] There are four main challenges in conducting strategic forecasting that this thesis attempts to overcome: data availability, issue complexity, analytic process, and institutional constraints.[2] To overcome the challenges of complexity and data availability, the United States should work to identify the key drivers of international migration utilizing Maslow's hierarchy of needs as a framework for identifying unmet necessities in the populace. Additionally, analysts should use technological resources, such as internet search analysis and satellite imagery. Once the key drivers have been identified, the United States should establish metrics for monitoring those drivers with the aim of detecting when migration stressors reach thresholds and intervening when necessary to prevent mass-migration flows.[3]

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[1] Iana Dreyer and Gerald Stang, "Foresight in Governments—Practices and Trends around the World," in *YES 2013: EUISS Yearbook of European Security*, ed. Antonio Missiroli (Paris: European Union Institute for Security Studies, 2013), 13, https://www.iss.europa.eu/content/euiss-yearbook-european-security-2013.

[2] Thomas Juneau, *Strategic Analysis in Support of International Policy Making* (Lanham, MD: Rowman & Littlefield, 2017), 60.

[3] Demetrios G. Papademetriou and Kate Hooper, *Building Partnerships to Respond to the Next Decade's Migration Challenges* (Washington, DC: Migration Policy Institute, 2017), 48, https://www.migrationpolicy.org/research/building-partnerships-respond-next-decades-migration-challenges.

Analyzing migration factors through the lens of Maslow's hierarchy of needs reveals several key findings that could assist the U.S. government in evaluating which countries are at risk of mass migration and where migrants may travel. Mass migrations are more likely to come from countries with underperforming economies and those involved in conflict.[4] They are also more likely to come from countries that rate poorly on the corruption perception index, which reflects the level of crime and corruption a country is experiencing.[5] Therefore, migrants tend to be drawn to countries that are more lawful and less corrupt than their original countries. Also, migrants are drawn toward locations where they have family or cultural connections. Finally, climate change should be expected to exacerbate these migration stressors.

Next, the thesis examines emerging technologies that could be used to help improve the accuracy of migration anticipation, namely satellite technology, internet search analysis, and cell-phone tower tracking. Scientists have used satellites to detect migration stressors such as water scarcity, disease, and crop failure before they reach their breaking point.[6] Moreover, researchers have used internet search analysis to successfully forecast domestic and international migration more than one year in advance.[7] Cell-phone tower data, too, have shown population movements in real time and estimated the total number of displaced persons with a high degree of accuracy.[8] This paper recommends the

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[4] Reginald E. Johnson III, "Using Maslow's Hierarchy of Needs to Identify Indicators of Potential Mass Migration Events" (master's thesis, Joint Forces Staff College, 2016), https://apps.dtic.mil/sti/citations/AD1017743.

[5] Johnson.

[6] Mary D. Dysart, "Remote Sensing and Mass Migration Policy Development" (master's thesis, Air War College, 2011).

[7] Allen Yilun Lin, Justin Cranshaw, and Scott Counts, "Forecasting U.S. Domestic Migration Using Internet Search Queries," in *Proceedings of the World Wide Web Conference* (New York: Association for Computing Machinery, 2019), 1061–72, https://doi.org/10.1145/3308558.3313667; Marcus H. Böhme, André Gröger, and Tobias Stöhr, "Searching for a Better Life: Predicting International Migration with Online Search Keywords," *Journal of Development Economics* 142 (January 2020): 102347, https://doi.org/10.1016/j.jdeveco.2019.04.002.

[8] Linus Bengtsson et al., "Improved Response to Disasters and Outbreaks by Tracking Population Movements with Mobile Phone Network Data: A Post-Earthquake Geospatial Study in Haiti," *PLOS Medicine* 8, no. 8 (2011): e1001083, https://doi.org/10.1371/journal.pmed.1001083.

complementary use of all three technologies to improve the accuracy of migration forecasting.

Having explored the underlying factors of mass migration, ways to quantify them, and the technology to increase forecasting accuracy, this thesis then discusses potential modeling methods to synthesize the data. For example, the disparate characteristics of migration flows, labor trends, and asylum applications must be modeled differently.[9] Likewise, forecasting models capture different data components, so in relying on a single model, analysts may failure to capture nuance in the data. Several types of modeling have proven useful in anticipating migration movements: agent-based modeling, probabilistic forecasting models such as Bayesian modeling, and Markov chain models.

Agent-based modeling is a useful tool for anticipating migration movements by factoring in both individual decision-making processes and the effect of relationships in social networks on those decisions.[10] Agent-based models have utility in guessing whether individuals will migrate and estimating how long it will take them and where they will go. One of the benefits of agent-based models is that many of the researchers utilizing them in the migration context have published their simulation code for public use. U.S. immigration authorities could use this code to help simulate migration destinations along the southwest border.

Another modeling method for anticipating migration trends is the Bayesian model, which allows for the combination of different data sources. It allows an analyst to coalesce different datasets, historical trends, and expert judgment coherently.[11] Bayesian models have successfully predicted migration in various scenarios with a promising degree of accuracy.

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[9] Jakub Bijak et al., "Assessing Time Series Models for Forecasting International Migration: Lessons from the United Kingdom," *Journal of Forecasting* 38, no. 5 (2019): 481, https://doi.org/10.1002/for.2576.

[10] Anna Klabunde and Frans Willekens, "Decision-Making in Agent-Based Models of Migration: State of the Art and Challenges," *European Journal of Population* 32, no. 1 (February 2016): 74, https://doi.org/10.1007/s10680-015-9362-0.

[11] George Disney et al., *Evaluation of Existing Migration Forecasting Methods and Models* (Southhampton, UK: ESRC Centre for Population Change, University of Southampton, 2015), 21, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/467405/Migration_Forecasting_report.pdf.

Markov chain models are another method that has shown relevance in migration projections. Such models are network models that anticipate the next step of an agent assuming that the future is independent of the past.[12] Notably, Markov chain models hold some advantages over agent-based models in terms of efficiency. Whereas an agent-based model may require data from dozens of files and need thousands of lines of code to operate, Markov chain models can be contained in a single file and require fewer than 500 lines of code.[13]

Following the modeling discussion, the thesis turns to the task of building the institutional capacity for strategic foresight work in the federal government. This thesis explores foreign and domestic strategic-forecasting units to identify best practices in establishing a successful migration anticipation unit. In examining the way other entities conduct strategic forecasting, this thesis highlights several relevant themes that would apply to a mass-migration anticipation unit in the United States. First, such units collaborate horizontally across the government and with external stakeholders to improve accuracy and keep foresight at the front of people's minds. Second, such units have direct access to decision-makers who can act quickly on the units' recommendations. Third, the units operate with relative autonomy. Finally, having freedom from responding to today's crises allows them to focus on the future. These are all factors that could be implemented in an American mass-migration anticipation unit.

Ultimately, this thesis makes the following recommendations:

1. Establish a strategic foresight unit within the Department of Homeland Security, tasked with anticipating mass migrations to the United States.
2. Delegate the authority to declare a mass migration to the lowest level possible to expedite deployment of resources to the southwest border and to originating countries in anticipation of a mass-migration event.

[12] Joe Blitzstein, "Introducing Markov Chains," February 28, 2020, YouTube video, 4:45, https://www.youtube.com/watch?v=JHwyHIz6a8A.

[13] Vincent Huang and James Unwin, "Markov Chain Models of Refugee Migration Data," ArXiv:1903.08255 (Ithaca: Cornell University, 2019), http://arxiv.org/abs/1903.08255.

3. Establish an operational response unit for mass migrations along the southwest border.

4. Establish appropriate funding mechanisms for the strategic foresight unit and mass-migration operational response unit.

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ACKNOWLEDGMENTS

I would like to take this opportunity to thank my village, without which this thesis could not have been completed. Two weeks after being accepted to the Naval Postgraduate School, COVID-19 shut down the world. As the parent of three children, one at high risk of contracting COVID, this life-altering event presented a host of challenges. It also made it even more clear how lucky I am to have such an incredible support system.

I first want to thank my husband, Matt, for holding down the fort, so I could devote time to my studies. For most of this program, with no safe place to go during the pandemic, my husband took our three young children on long drives every Saturday to give me time alone in our house to study and work on my thesis. Honey, I could not have done this without you. Thank you.

I am grateful to my children. Boys, thank you for being patient with me these last 18 months. Also, let this serve as your official notice that unlimited screen time is over. Get ready for educational activities and sports practices. Mommy is back!

I am also grateful to my advisors, Rodrigo Nieto-Gómez, and Anne Marie Baylouny, for their time and expert feedback in making this thesis the best it could be.

I am grateful to my friends and family members who let me bounce ideas off them, allowed me to study in their homes during the pandemic, and watched my children, so I could work on this thesis.

I am grateful to my agency for providing me with the space and time to work on this thesis, specifically my peers and employees in Philadelphia, Dover, and Washington, DC, who often covered for me at work while I attended school. I also want to thank my many coworkers who shared their perspectives with me to help guide this thesis. Your viewpoints were invaluable, and I hope I have made you proud.

I also want to thank my readers, specifically Katelyn Wright and Colin Adams, for helping me bounce ideas and for taking the time to give me feedback on my thesis. I really appreciate you both.

I would also like to thank the staff at CHDS for all their support over the last 18 months. While there are too many to mention, I especially want to recognize Greta Marlatt, my fairy god-librarian, who provided me with so many critical resources during this time.

Last but not least, I want to recognize my classmates at NPS. Attending this program during COVID was less than ideal. But knowing we were all in the same boat and were supporting each other every step of the way made the whole thing worthwhile. I will miss hearing your viewpoints on current events and hope we will all stay close moving forward.

I. INTRODUCTION

A. RESEARCH QUESTION

How can the U.S. government improve its foresight capacity to anticipate and manage mass-migration events?

B. BACKGROUND

Mass migrations to the United States are nothing new. From Irish immigrants fleeing the potato famine in the 1840s to Cubans fleeing Fidel Castro's regime during the Mariel boatlift in 1980—when 124,776 Cuban migrants entered the United States during a six-month period—to the wave of Central American migrants in the 1990s and the present-day influx of Central American family units, the U.S. immigration system has experienced mass migrations repeatedly over generations.[1] While mass migrations in the 2010s constituted large quantities of people, they were also qualitatively different in their composition of asylum seekers, family units, and migrant children. This was a distinct change from prior migrations, which were mostly composed of single adult males seeking work in the United States, and presented new challenges to U.S. immigration authorities' ability to respond. Given the U.S. government's vast history of dealing with mass migrations, it is surprising that it has not developed an effective mechanism for anticipating them. This thesis explores the question of how the U.S. government can improve its foresight capacity to anticipate and manage mass-migration events.

First, it is necessary to identify the U.S. agencies involved in the immigration process. Customs and Border Protection (CBP) enforces immigration law at designated ports of entry and, to a lesser extent, through air and marine operations. The Border Patrol, which is part of CBP, enforces immigration law between ports of entry along U.S. land borders and around the coastal waters of Florida and Puerto Rico. Immigration and Customs Enforcement (ICE) enforces immigration law in the interior of the United States

[1] Reginald E. Johnson III, "Using Maslow's Hierarchy of Needs to Identify Indicators of Potential Mass Migration Events" (master's thesis, Joint Forces Staff College, 2016), https://apps.dtic.mil/sti/citations/AD1017743.

and oversees immigration detention facilities. Citizenship and Immigration Services (CIS) grants immigration benefits including asylum and refugee claims. The U.S. Coast Guard has limited immigration powers along maritime routes. Each agency plays a critical role in the U.S. immigration system and relies on cooperation among the other agencies to affect the mission.[2]

Department of Homeland Security (DHS) does not have a consolidated government entity tasked with anticipating and responding to mass-migration events at the southwest border. Previously, the Joint Task Force West responded to mass-migration events. As a government task force, it comprised all immigration entities with a nexus to the southwest border. It was quietly disbanded in 2020, and no entity has since replaced it.[3] However, even when it was operational, the Task Force failed to gain traction in terms of command hierarchy within DHS—as directors of the immigration agencies viewed it as a threat to their authority.[4] Also, failing to garner the support it needed from DHS, the Task Force was given no authority and no access to resources to respond to mass-migration events absent a declaration by the president or secretary of homeland security. Resting the authority of these declarations in the hands of such high-ranking officials resulted in unnecessary delays and prevented the Task Force from leveraging an organized, coordinated response.

Several agencies outside DHS also play a role in immigration: the Department of State grants visas, the Office of Refugee Resettlement (ORR) under the Department of Health and Human Services oversees the placement of migrant children and refugees, and the Executive Office of Immigration Review under the Department of Justice hears judicial immigration proceedings. In total, eight agencies under four different departments play a

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[2] Before the establishment of the Department of Homeland Security (DHS) in 2002, CBP, CIS, and ICE were all one consolidated government entity known as the Immigration and Naturalization Service, or INS. Older documents quoted in this thesis reference this organization, but its responsibilities fall to the newer agencies.

[3] Anna Giaritelli, "DHS Secretly Shuttered Obama-Era Task Force, Empowering Border Patrol Parent Agency," *Washington Examiner*, October 9, 2020, https://www.washingtonexaminer.com/news/dhs-secretly-shuttered-obama-era-task-force-empowering-border-patrol-parent-agency.

[4] Giaritelli.

role in the U.S. immigration system. For the purposes of this paper, unless the author refers specifically to one of these entities, all will be referred to as "U.S. immigration authorities."

Second, this thesis requires the explanation of key terms used throughout the paper. The term "family unit" refers to noncitizen children under 18 and their parents or legal guardians. The current legal term used to describe children who illegally enter the United States without a parent is "unaccompanied alien child." This term is defined in *U.S. Code* as follows: "a child who has no lawful immigration status in the United States; has not attained 18 years of age; and with respect to whom there is no parent or legal guardian in the United States or no parent or legal guardian in the United States available to provide care and physical custody."[5] While this term is still widely used within immigration circles, due to evolving public opinion surrounding the word "alien" and out of respect for the children involved, this thesis uses the term "migrant child" instead.

Third, this paper examines illegal, or "irregular," migrations. This term refers to people entering a host country without the proper paperwork or permission to do so. The reason this paper focuses on illegal migrations is that, historically, these have been most difficult to predict.[6] While regular migrants are subject to visa limitations—meaning the United States allows only a certain number of individuals to enter each year—the same cannot be said for irregular migrations.[7] These are the migrations most likely to overwhelm the U.S. immigration system and most difficult to anticipate and thus prepare for.[8]

Fourth, no agreed-upon number constitutes a mass migration.[9] For the purposes of this paper, "mass migration" is defined as any migration that overwhelms the immigration

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[5] 6 U.S.C. § 279(g)(2) (2008), quoted in David Gootnick, *Central America: Information on Migration of Unaccompanied Children from El Salvador, Guatemala, and Honduras*, GAO-15-362 (Washington, DC: Government Accountability Office, 2015), 1, https://www.gao.gov/products/GAO-15-362.

[6] Marcello Carammia and Jean-Christophe Dumont, "Can We Anticipate Future Migration Flows?," *Migration Policy Debates*, no. 16 (May 2018): 1–9.

[7] For immigrant visa categories not constrained by visa limitations, U.S. immigration authorities have established predictive methods to determine how many immigrants are likely to apply to enter the United States each year.

[8] Carammia and Dumont, "Can We Anticipate Future Migration Flows?"

[9] Lance Clark, *Early Warning of Refugee Flows* (Washington, DC: Refugee Policy Group, 1989), http://repository.forcedmigration.org/show_metadata.jsp?pid=fmo:3342.

system. However, the number of people it takes to overwhelm the U.S. immigration system varies widely by country of origin or circumstance. For example, a group of 10,000 adult male Spanish-speaking migrants entering within a one-week period would not likely overwhelm the immigration system because immigration agents are trained to speak Spanish and have access to many Spanish interpreters. The same cannot be said for a group of 10,000 Bengali migrants crossing in the same period, as access to interpreters is much more limited.

Furthermore, the same cannot be said for 10,000 migrant children or family units entering within the same period, due to the different level of care needed for those groups of migrants. For example, young children need a higher level of care and attention than do adults—they may need diapers or more frequent bathroom breaks, among other things. Family units should ideally be held together for the sake of unity. This may require mixed-gender housing, as in the case of mothers traveling with sons or fathers with daughters. In this case, adequate migrant housing would quickly run out, causing the system to be overwhelmed. This thesis recognizes such nuances and, thus, does not attempt to quantify the term mass migration.

Fifth, the writer of this paper has been careful to use only publicly available information for the purposes of predicting mass migrations. Current attempts to predict mass migration in the United States are done within the classified sphere using intelligence and country conditions not currently available to the public. This thesis posits that mass migration can be anticipated using open-source information. Moreover, beyond being unnecessary, classified information is unhelpful because it presents a significant barrier to the U.S. government's preparation for and even knowledge about mass migrations. Many employees working for U.S. immigration authorities do not have sufficient security clearances to access classified reports. Thus, classifying the information can have the ill-intended effect of preventing mass-migration indicators from reaching the hands of the people who need them the most. For this reason, this thesis focuses solely on the use of publicly available information with the hopes that with broad distribution, the recommendations set forth here can be championed by any person or organization that sees the value in them.

1. The U.S. Immigration Process

Most persons attempting to enter the United States as part of a mass migration do so via land crossing at the southwest U.S. border. This typically happens in one of two ways. The persons either attempt to cross the border illegally between ports of entry, thus placing them under the jurisdiction of the Border Patrol if detained, or turn themselves in to CBP at a port of entry and request asylum. In either case, non-citizens are served charging documents and moved to CBP processing centers. Adults who do not claim asylum are either voluntarily returned to their country or removed via an expedited removal order. Adults who cannot be returned quickly are turned over to ICE for detention or release into the community or, in the most serious cases, turned over to the Department of Justice for criminal prosecution.

Adults or family units who have never been to the United States before and are claiming asylum are served removal documents and have their fear claims sent to CIS, which schedules a credible-fear interview. If CIS deems their fear claims to be legitimate, their cases are referred to an immigration judge in the Executive Office of Immigration Review for a removal hearing. If CIS does not deem their fear claims to be legitimate, the migrants must either appeal the decision to an immigration judge or face removal from the United States.

Unaccompanied migrant children apprehended at the border are turned over to the ORR for placement. If they make a fear claim, their information is sent to CIS for a credible-fear determination, as with the adults. The ORR attempts to place the children with a sponsor. Once a sponsor is located, the ORR considers its involvement with the case closed—though it has in recent years conducted a 30-day outreach call after placement.[10]

When migrants are placed in immigration detention or released into the community, ICE monitors the cases, follows up with CIS when needed on fear decisions, and ensures all charging documents are served for the Executive Office of Immigration Review so that

[10] William A. Kandel, *Unaccompanied Alien Children: An Overview*, CRS Report No. R43599 (Washington, DC: Congressional Research Service, 2019), 13, https://crsreports.congress.gov/product/pdf/R/R43599.

migrants begin their immigration court process. ICE also monitors migrants in the community or in detention and oversees migrants' cases as they move through the immigration court system. If a migrant is ordered to be removed from the United States, it falls to ICE to enforce that removal order, assuming it has the necessary staffing and resources to do so.

2. Applicable Laws and Conventions

Numerous international conventions, relevant laws, and judicial settlements shape the way immigration is handled in the United States. The most important ones are summarized here for reference.

a. Human Rights Conventions

In 1951, the U.S. participated in the United Nations 1951 Convention Relating to the Status of Refugees. This committee entered into agreements and recommendations on the treatment of refugees. Specifically, this committee found "that the unity of the family, the natural and fundamental group unit of society, is an essential right of the refugee."[11] It further recommended that "governments…take the necessary measures for the protection of the refugee's family especially with a view to…ensuring that the unity of the refugee's family is maintained."[12]

b. Federal Laws

Two laws guide the U.S. government's treatment of migrant children in the United States—the Trafficking Victims Protection Act of 2008 and the Homeland Security Act of 2002. The Homeland Security Act puts the director of the ORR in charge of placing and caring for migrant children. It charges the ORR with finding "a sufficient number of qualified individuals, entities, and facilities to house unaccompanied alien children."[13]

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[11] United Nations High Commissioner for Refugees, *Convention and Protocol Relating to the Status of Refugees* (Geneva: United Nations High Commissioner for Refugees, 1967), 10, https://www.unhcr.org/protection/basic/3b66c2aa10/convention-protocol-relating-status-refugees.html.

[12] United Nations High Commissioner for Refugees, 10.

[13] Homeland Security Act of 2002, Pub. L. No. 107–296, 116 Stat. 2135 (2002), 2203, https://www.dhs.gov/homeland-security-act-2002.

Furthermore, it specifies that placement of migrant children must be in such a way as to ensure the children "are likely to appear for all hearings or proceedings in which they are involved" and "are protected from smugglers, traffickers, or others who might seek to victimize or otherwise engage them in criminal, harmful, or exploitive activity."[14] The Trafficking Victims Protection Act further specifies that children from non-contiguous countries must be referred to the ORR within 72 hours. From there, migrant children are screened and placed in the "least restrictive setting possible."[15]

c. Judicial Settlements

The presiding court decision determining the treatment of migrant children and family units in the United States is the *Reno vs. Flores* settlement, which governs the detention of minors for immigration purposes. In 1997 this court decision established "nationwide policy for the detention, release, and treatment of minors detained in Immigration and Naturalization Service [INS] custody."[16] Specifically, the decision held that U.S. immigration authorities "shall hold minors in facilities that are safe and sanitary."[17] In addition, "within five days of arrest, the INS must transfer the minor to a non-secure, licensed facility."[18]

C. PROBLEM STATEMENT

Mass migrations at the southwest border are nothing new, but surges in unaccompanied minors and family units crossing the border in short periods are increasingly overwhelming the U.S. government's capacity to respond. Between fiscal year

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[14] Homeland Security Act of 2002, 2204.

[15] Human Trafficking Protection Act, H. Res.436, 115th Cong. (2017), https://www.congress.gov/bill/115th-congress/house-bill/436.

[16] Flores v. Lynch, No. 15-56434, 2 (9th Cir. filed July 6, 2016), https://law.justia.com/cases/federal/appellate-courts/ca9/15-56434/15-56434-2016-07-06.html.

[17] *Flores*, at 7.

[18] *Flores*, at 7.

2008 and 2014, the United States experienced an eight-fold increase in the number of unaccompanied migrant children arrested at the U.S.–Mexican border.[19]

1. Family Units and Migrant Children

Likewise, the number of family unit cases reported by CBP has increased exponentially. In 2013, 14,855 family unit cases were apprehended at the southwest border, but by 2014, the number of family unit cases had increased to 68,445.[20] These numbers overwhelmed the immigration system—inundating detention space, exceeding medical response capabilities, and causing massive delays in the court and asylum systems—but they were only the beginning.

By 2019, family unit arrests at the southwest border skyrocketed to 473,682 (see Figure 1).[21] With no coordinated government-wide effort to anticipate such events, the U.S. government continues to be surprised by mass-migration events. Without the ability to anticipate such mass-migration events, U.S. immigration officials cannot effectively prepare a response.

[19] Customs and Border Protection, "U.S. Border Patrol Nationwide Apprehensions by Citizenship and Sector (FY2007–FY2019)" (Washington, DC: Customs and Border Protection, 2020), https://www.cbp.gov/newsroom/media-resources/stats.

[20] Customs and Border Protection, "U.S. Border Patrol Total Monthly Family Unit Apprehensions by Sector (FY2013–FY2019)" (Washington, DC: Customs and Border Protection, 2020), 1–2, https://www.cbp.gov/newsroom/media-resources/stats.

[21] Customs and Border Protection, 7.

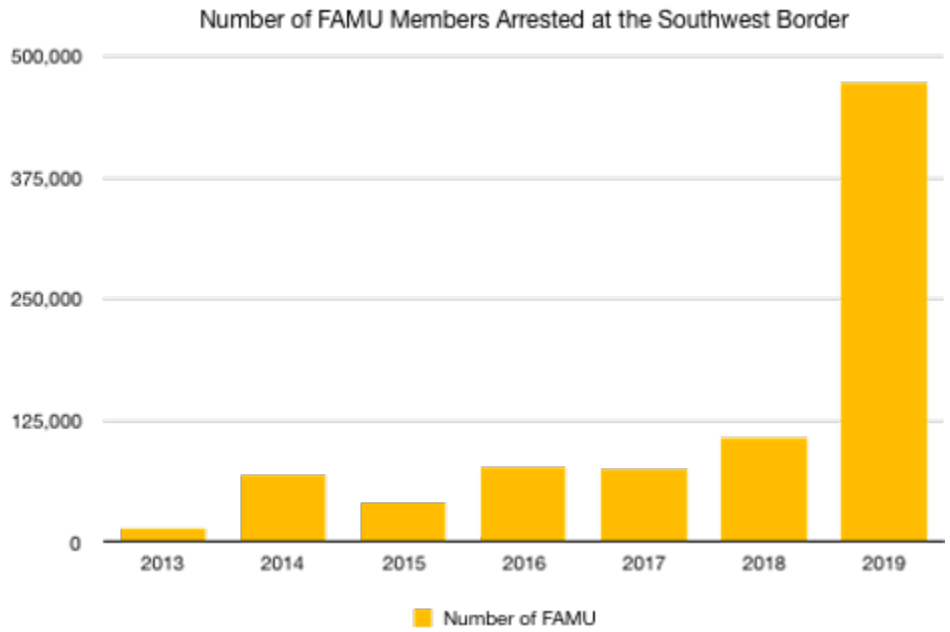

Figure 1. Number of Family Unit Members Entering the United States, 2013–2019[22]

Mass-migration events that surprise the U.S. government have humanitarian, legal, and financial consequences. For example, in 2019, despite yearly increases in the number of unaccompanied minors and family unit cases, the ORR—the agency charged with housing unaccompanied migrant children and family units—had insufficient beds available to house the children. At the time, they had only three facilities open that could house family unit cases, with a cumulative total of 3,326 beds.[23] The lack of bedspace resulted in a bottleneck to the immigration system and prevented CBP from promptly transferring non-citizens to adequate housing facilities. With no place to send migrants, CBP's holding facilities, meant only for temporary housing, became overcrowded, which led to unsanitary living conditions.[24]

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[22] Source: Customs and Border Protection, "Total Monthly Family Unit Apprehensions."

[23] Rebecca Gambler, *Southwest Border: Actions Needed to Improve DHS Processing of Families and Coordination between DHS and HHS*, GAO-20-245 (Washington, DC: Government Accountability Office, 2020), https://www.gao.gov/products/GAO-20-245.

[24] Department of Homeland Security Inspector General, *Management Alert—DHS Needs to Address Dangerous Overcrowding and Prolonged Detention of Children and Adults in the Rio Grande Valley*, OIG-19-51 (Washington, DC: Department of Homeland Security Inspector General, 2019), https://www.oig.dhs.gov/sites/default/files/assets/2019-07/OIG-19-51-Jul19_.pdf.

This lack of infrastructure, combined with backlogs, resulted in migrant children being held longer than allowed under the aforementioned *Flores* settlement.[25] Specifically, *Flores* required the federal government to "house all juveniles detained more than 72 hours following arrest in a facility that meets or exceeds" specific standards, except in "unusual and extraordinary circumstances."[26] When the mass migration of the 2010s began, U.S. immigration authorities could no longer meet the stringent timelines imposed by *Flores*.

By failing to adhere to these safeguards, U.S. immigration authorities have created a chain of negative outcomes for migrant children. For one, overcrowding in CBP facilities has hindered basic sanitation, which has led to unsanitary living conditions. This lack of sanitation combined with a "lack of effective infection control procedures" has resulted in disease outbreaks.[27] Disease outbreaks combined with a "lack of adequate infrastructure for medical evaluation" within CBP facilities have resulted in more than a dozen hospitalizations and several deaths of migrant children in custody.[28]

Furthermore, juvenile migrants have been put in harm's way due to other systemic strains on the immigration system. For example, under pressure to free up detention space by quickly moving juvenile migrants into the care of a sponsor, the ORR began rushing background checks on the children's potential sponsors.[29] As a result, some children were placed with unfit sponsors, including child traffickers and sexual abusers.[30] Others were forced to work or not allowed to attend school.[31] Others were simply lost. In April 2018, a Health and Human Services official admitted in senate testimony that the ORR could not

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[25] *Flores*, No. 15-56434.

[26] *Flores*, at 6.

[27] Mark A. Travassos, "A 'Natural Death': The Political Battlefield of Infections and Migrant Children's Bodies," *Clinical Infectious Diseases* 70, no. 12 (June 2020): 2721–23, https://doi.org/10.1093/cid/ciz1026.

[28] Travassos, "A 'Natural Death'"; Edith N. Nyangoma et al., "Notes from the Field: Hospitalizations for Respiratory Disease among Unaccompanied Children from Central America—Multiple States, June–July 2014," *Morbidity and Mortality Weekly Report* 63, no. 32 (2014): 698–99.

[29] Marjorie S. Zatz and Nancy Rodriguez, *Dreams and Nightmares: Immigration Policy, Youth, and Families* (Berkeley: University of California Press, 2015), https://muse.jhu.edu/book/41217/.

[30] Gambler, *Southwest Border*; Zatz and Rodriguez, *Dreams and Nightmares*.

[31] Zatz and Rodriguez, *Dreams and Nightmares*.

locate 1,475 of the 7,635 unaccompanied migrant children placed with sponsors during a three-month period in 2017.[32] Had the U.S. government anticipated this mass-migration event and established surge capacity housing for the migrant children, such negative outcomes could have been prevented.

2. The Public Safety and National Security Nexus

In a 2018 report, the House Homeland Security Committee concluded the following: "While many migrants undertaking the long and dangerous journey to the United States do so seeking a better life for themselves and their families, nefarious actors exploit the same routes to infiltrate the Homeland."[33] The southwest border is vulnerable to illegal activities such as drug smuggling and terrorist activities.[34] When mass-migration events overwhelm U.S. immigration authorities, they can exacerbate security vulnerabilities. Migrants are not the only ones who enter the United States via the southwest border. Gang members, criminals, terrorists, and foreign fugitives can all exploit established smuggling routes and the porous southwest border, especially during a mass-migration event when resources are stretched thin.

In congressional testimony, former Homeland Security Secretary Kirstjen Nielsen expressed concern that terrorists could use smuggling routes to enter the United States surreptitiously.[35] She noted that the Islamic State of Iraq and the Levant had been encouraging its members to enter the United States via the southwest border.[36] She also asserted that, on average, DHS prevented 10 terrorists a day from entering the United

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[32] Kandel, *Unaccompanied Alien Children: An Overview*, 13.

[33] House Homeland Security Committee, *Stopping Terrorist Travel through Illicit Pathways to the Homeland* (Washington, DC: House of Representatives, 2019), 8, https://cis.org/sites/default/files/2019-01/396705631-SIA-Report-2018.pdf.

[34] Elizabeth A. Field, *Southwest Border Security: Actions Are Needed to Address the Cost and Readiness Implications of Continued D.O.D. Support to U.S. Customs and Border Protection*, GAO-21-356 (Washington, DC: Government Accountability Office, 2021), 1, https://www.gao.gov/assets/gao-21-356.pdf.

[35] *Strengthening the Safety and Security of Our Nation: The President's FY2019 Budget Request for the Department of Homeland Security: Hearing before the Committee on Homeland Security*, *House of Representatives*, 115th Cong., 2 (2018), https://docs.house.gov/Committee/Calendar/ByEvent.aspx?EventID=108191.

[36] H.R. *Strengthening the Safety and Security of Our Nation*.

States.[37] The concern over terrorists utilizing the southwest border to gain entry to the United States has also been mentioned in homeland security risk analyses. One such report in 2009 went so far as to claim that the probability of a terrorist successfully entering the United States was very high.[38]

Nevertheless, available data surrounding the terrorism risk at the southern border are far less convincing. DHS claims to prevent 10 known or suspected terrorists from entering or traveling to the United States each day—but at the same time admits that most of these people are attempting to enter by air.[39] Between 2005 and 2018, there have been only five notable criminal convictions for individuals smuggling special-interest migrants through the southwest border.[40] However, undocumented migrants, even those originating in special-interest countries are not necessarily terrorists.

Furthermore, out of all terrorist attacks in the United States from 1975 to 2017, only nine were committed by people who entered the country illegally, and in no instance was anyone killed or injured.[41] To give this perspective, these nine cases represent 0.000029 percent of the undocumented migrants who entered the United States during that timeframe.[42] Nonetheless, even one terrorist entering the United States is one too many, so border officials must have the time and resources to maintain orderly processing at the border to prevent known or suspected terrorists from entering the country.

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[37] "Secretary Nielsen Receives Operational Briefing on Israeli Security Technology, Delivers Remarks at the International Homeland Security Forum," Department of Homeland Security, June 12, 2018, https://www.dhs.gov/news/2018/06/12/secretary-nielsen-receives-operational-briefing-israeli-security-technology-delivers.

[38] Lawrence Wein, Yifan Liu, and Arik Motskin, "Analyzing the Homeland Security of the U.S.–Mexico Border," *Risk Analysis* 29, no. 5 (May 2009): 1, https://doi.org/10.1111/j.1539-6924.2008.01180.x.

[39] "Myth/Fact: Known and Suspected Terrorists/Special Interest Aliens," Department of Homeland Security, January 7, 2019, https://www.dhs.gov/news/2019/01/07/mythfact-known-and-suspected-terroristsspecial-interest-aliens.

[40] House Homeland Security Committee, *Stopping Terrorist Travel*, 5, 10. Special interest migrants are characterized as persons from nations hostile to the United States or from areas in the world where terrorism is prevalent.

[41] Alex Nowrasteh, *Terrorists by Immigration Status and Nationality: A Risk Analysis, 1975–2017*, Policy Analysis No. 866 (Washington, DC: Cato Institute, 2019), https://www.cato.org/publications/policy-analysis/terrorists-immigration-status-nationality-risk-analysis-1975-2017.

[42] Nowrasteh.

Terrorists, however, are not the only security risks attempting to gain entry to the United States through the southwest border. Gang members, including juvenile gang members, are entering, too. A whistleblower report from 2017 noted that at least 16 known juvenile MS-13 gang members were admitted into the United States during the mass migration of family units in 2014.[43] Gang members, including those from MS-13, are responsible for a host of violent acts in the United States. As a recent example, in an indictment released in January 2021, the U.S. Attorney's Office for the Southern District of New York charged 14 MS-13 gang members with terrorism-related offenses.[44] In a press release commemorating the indictment, then-acting U.S. Attorney Seth D. Ducharme stated, "MS-13 is responsible for a wave of death and violence that has terrorized communities, leaving neighborhoods…awash in bloodshed."[45] Likewise, each year, the Border Patrol arrests thousands of criminal non-citizens attempting to enter the United States.[46] While most of these migrants are turned away at the border, those coming with minor children, in the absence of available detention space, may end up being released into the United States.

When mass migrations strain border resources, they exacerbate cross-border security risks. This can result in terrorists, gang members, and criminal non-citizens gaining access to the United States. But humanitarian and security consequences are not the only negative effects of mass-migration events. The next section examines the financial toll exacted during a mass-migration event.

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[43] Stephen Dinan, "Obama Admin Knew Gang Members Were Part of Illegal Immigrant Surge: Whistleblower," *Washington Times*, May 24, 2017, https://www.washingtontimes.com/news/2017/may/24/whistleblower-dhs-knowingly-let-ms-13-gang-members/.

[44] "MS-13's Highest-Ranking Leaders Charged with Terrorism Offenses in the United States," Department of Justice, January 14, 2021, https://www.justice.gov/opa/pr/ms-13-s-highest-ranking-leaders-charged-terrorism-offenses-united-states.

[45] Department of Justice.

[46] "Criminal Noncitizen Statistics Fiscal Year 2021," Customs and Border Protection, August 12, 2021, https://www.cbp.gov/newsroom/stats/cbp-enforcement-statistics/criminal-noncitizen-statistics.

3. The Financial Toll

The failure to anticipate mass-migration events also takes a financial toll on the receiving country. During the 2014 mass migration of family units, the Obama administration submitted a $3.7 billion emergency supplemental funding request to address the border crisis to care for the children, fund detention and enforcement along the southwest border, disseminate educational campaigns about the dangers of the journey to the United States, conduct deterrence in the originating countries, and guide repatriation of migrants being removed.[47]

4. Legal Consequences

The U.S. government's inability to anticipate mass migration have come with legal consequences. International agreements, national laws, and judicial settlements have been put in place to protect migrants, and failing to honor these agreements have reflected poorly on the United States.[48] For example, since the *Flores* settlement, a judicial consent decree has governed the detention of minors for immigration purposes, but during the mass migration of family units in the 2010s, the U.S. government was sued for violating this legal precedent.[49] Moreover, the United States was publicly shamed by the United Nations for its treatment of family units during this crisis.[50] When the U.S. government fails to honor its agreements, it comes at the cost of diminishing its international reputation.

D. PURPOSE

The core argument of this thesis is that had the U.S. government been monitoring migration flows with an eye to the future, it may have prevented many of the negative outcomes of such events. The U.S. government can and must build out the capability to

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[47] Zatz and Rodriguez, *Dreams and Nightmares*; Gambler, *Southwest Border*.

[48] United Nations High Commissioner for Refugees, *Convention and Protocol Relating to the Status of Refugees*; Homeland Security Act of 2002; *Flores*, No. 15–56434.

[49] Reno v. Flores, 507 U.S. 292 (9th Cir. 1993); *Flores*, No. 15–56434.

[50] Nick Cumming-Bruce, "Taking Migrant Children from Parents Is Illegal, U.N. Tells U.S.," *New York Times*, June 5, 2018, https://www.nytimes.com/2018/06/05/world/americas/us-un-migrant-children-families.html.

anticipate mass-migration flows. The goal of creating this institutional capability would be to shift the focus of U.S. immigration authorities from a reactionary to an anticipatory stance to responding to mass-migration events. Instead of responding after the mass migration has occurred—resulting in delays in supplies, infrastructure, and medical capabilities—the U.S. government should improve its horizon-scanning and strategic-foresight capabilities to get ahead of mass-migration events. By increasing the warning time ahead of a mass migration, the United States could prepare a more robust response.

U.S. immigration authorities need time to prepare for mass-migration events. New screening and detention facilities must be operationalized, staffing and supplies sent to affected areas, and adequate public health measures put in place. These things take time. The lead time typically needed for the United Nations to prepare for a mass migration is three to four months.[51] This is the minimum timeline U.S. immigration authorities should strive to achieve when anticipating mass-migration events. Strategies to improve this warning time, such as migration forecasting, advanced modeling, and emerging technologies, may prove useful in this effort, but increasing warning time alone is not enough to solve the challenges posed by mass migrations. Anticipating a mass-migration event solves nothing if U.S. immigration authorities do not have the command structure or funding in place to respond.

While anticipating mass migrations is no easy task, and the process might never be perfect, with the proper data, tools, and institutional capacity, anticipating mass-migration events is feasible—but only if the U.S. government commits to completing this work using a whole-of-government response.[52] Data must be gathered, analyzed, and disseminated in a coordinated manner. Instead of each immigration entity gathering its own information and developing its own plan and response to mass-migration events, U.S. immigration authorities should share information, partner with research institutions, and leverage their

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[51] Clark, *Early Warning of Refugee Flows*, 16.

[52] Mohammed N. Ahmed et al., "A Multi-Scale Approach to Data-Driven Mass Migration Analysis," in *Proceedings of the First Workshop on Data Science for Social Good*, ed. Ricard Gavaldà, Indrė Žliobaitė, and João Gama (Wadern, Germany: Leibniz Center for Infomatics, 2016), http://ceur-ws.org/Vol-1831/.

collective knowledge to get ahead of such events. This can be accomplished through the establishment of a strategic foresight unit tasked with anticipating mass migration.

Strategic foresight units around the world are leveraging improvements in technology and modeling capabilities to better anticipate and respond to mass-migration events. For example, Germany has a well-funded strategic foresight unit under its central government that projects international migration flows one year into the future.[53] It has subsequently been recognized for its humane handling of vast numbers of international migrants.[54] Unfortunately, no government entity in the U.S. immigration nexus currently examines these migratory flows and anticipates future mass-migration events. This inability to anticipate migration surges delays the U.S. government's response efforts, thus delaying personnel deployments and misallocating resources, among other planning problems. Ultimately, this lack of organization prohibits the U.S. government from effecting an organized, timely response.

Likewise, there is no effective command structure or funding source in place to respond to mass-migration events. Each agency leverages its own response when a mass migration occurs, using its own individual funding. This leads to a situation where no one is solely in charge of the border. It also promotes resource scarcity as each entity strains to adjust its budget to accommodate the mass-migration response efforts while sustaining its own operations. This lack of anticipation, structure, and funding hampers the U.S. government's ability to leverage and effect a coordinated response to mass-migration events. Therefore, unless changes are made, future mass-migration flows will continue to outpace the U.S. government's ability to respond.

E. LITERATURE REVIEW

A robust volume of research examines the underlying causes of international migration. Such literature stretches back over a hundred years and includes academic

[53] Carammia and Dumont, "Can We Anticipate Future Migration Flows?," 7.

[54] Sekou Keita and Helen Dempster, "Five Years Later, One Million Refugees Are Thriving in Germany," Center for Global Development, December 4, 2020, https://www.cgdev.org/blog/five-years-later-one-million-refugees-are-thriving-germany.

research, government reports, and information from international sources such as the United Nations, the International Organization on Migration, and the European Asylum Support Office. The seminal works on this topic were written by Ernest George Ravenstein in the 1880s, Everett Lee in the 1960s, and Lance Clark in the 1980s.[55] Notably, this literature review is not all-encompassing and does not strive to explain every nuance of the literature. Instead, it strives to explain the relevant concepts that can assist U.S. immigration authorities anticipate mass-migration events.

The use of the push-pull framework in examining international migration remains the dominant theory for explaining the phenomenon. The push-pull theory dates back to the 1880s when Ravenstein published his paper on the laws of migration for the *Journal of the Royal Statistical Society*.[56] While he did not use the terms "push" and "pull," preferring instead "dispersion" and "absorption," his laws of migration evolved into what is today known as the push-path-pull factor.[57] Lee then picked up on this work in the 1960s, solidifying it into the push-pull theory that lives on to this day.[58] While scholars over the years, such as Lance Clark, Susan Schmeidl, and Douglas Massey, have built on this work, many of the core principles—such as the role of conflict and economics in a migrant's decision to choose international migration and proximity being the biggest factor in determining where a migrant will go—have stood the test of time.

There are several areas of consensus in the literature regarding international migration, namely the importance of socioeconomic factors in driving international migration; the presence of family and human smuggling networks; the importance of conflict in driving international migration, such as armed conflict, political instability, and violence; and geographic proximity as a significant factor in where international migrants

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55 Everett Lee, "A Theory of Migration," *Demography* 3, no. 1 (1966): 47–57, https://doi.org/10.2307/2060063; Clark, *Early Warning of Refugee Flows*.

56 Ernest George Ravenstein, "The Laws of Migration," *Journal of the Statistical Society of London* 48, no. 2 (June 1885): 167–235.

57 Ravenstein.

58 Lee, "A Theory of Migration."

choose to migrate. Thus, this literature review examines the shape of international migration research.

1. Economics

For hundreds of years, researchers have recognized that economic factors play an important role in the decision to migrate. But coming to a consensus on which economic metrics are most closely correlated with migration outflows has proven far more difficult. Consensus exists in migration literature that wage differentials, employment rates, and economic growth in the destination country are the predominant drivers in migratory movements. This section elaborates on how migration research over the last few decades has led to this conclusion.

Early researchers focused on individual cost–benefit analyses as underlying drivers of international migration. For example, individuals were expected to migrate when the advantages of relocation generated a high return on investment for their labor.[59] Lewis proposed that migrants would continue to immigrate to destinations with higher wages and greater labor demands until the wage differentials no longer existed and a sense of equilibrium was reached.[60] Sjaadstad conceptualized international migration as a lifetime investment decision.[61] While noting the importance of income distributions in the originating and destination countries in the migrants' decision-making process, he recognized that income distributions alone were only one part of the equation. He also theorized that migrants would weigh personal factors in determining the lifetime return on investment for international migration. These personal factors include demographics such as age and sex, as well as skill sets and knowledge. If the investment is deemed favorable, according to Sjaadstad, migration is likely.[62]

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[59] W. Arthur Lewis, "Economic Development with Unlimited Supplies of Labor," *Manchester School of Economic and Social Studies* 22 (1954): 139–91.

[60] Lewis.

[61] Larry A. Sjaastad, "The Costs and Returns of Human Migration," *Journal of Political Economy* 70, no. 5, pt. 2 (October 1962): 80–93, https://doi.org/10.1086/258726.

[62] Sjaastad.

Borjas expanded on the cost–benefit analysis theory by conceptualizing an immigration market where potential migrants consider destination countries based on a cost–benefit analysis.[63] Borjas posited that migrants consider income differentials and long-term returns on investment in their choice of destination. He claimed that migration policies in both destination and originating countries are a factor weighed by migrants as part of this analysis.[64]

More recent studies have also noted the importance of wage differentials, employment rates, and economic growth in destination countries as drivers of international migration.[65] For example, Martineau observes that increases in gross domestic product have been "associated with decreased probability of a country producing refugees."[66] Conversely, Ruyssen has found that higher income and growth rates are primary attractors for migrants when choosing a destination country.[67] Kennan and Walker have examined expected income as a main driver of migration.[68] They theorize that people strive to maximize their lifetime earnings by continuously weighing the costs and benefits of migration to areas available to them.[69] Utilizing a discrete choice econometric model and comparing it to longitudinal youth data, their research indicates that expected income plays a significant role in the migration decision-making process.[70]

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63 George J. Borjas, "Economic Theory and International Migration," *International Migration Review* 23, no. 3 (1989): 457–85, https://doi.org/10.1177/019791838902300304.

64 Borjas.

65 European Asylum Support Office, *The Push and Pull Factors of Asylum-Related Migration: A Literature Review* (Valletta, Malta: European Asylum Support Office, 2016), 12, https://easo.europa.eu/sites/default/files/publications/The%20Push%20and%20Pull%20Factors%20of%20Asylum%20-%20Related%20Migration.pdf.

66 Joshua S. Martineau, "Red Flags: A Model for the Early Warning of Refugee Outflows," *Journal of Immigrant & Refugee Studies* 8, no. 2 (2010): 148, https://doi.org/10.1080/15562941003792093.

67 Ilse Ruyssen and Glenn Rayp, "Determinants of Intraregional Migration in Sub-Saharan Africa 1980–2000," *Journal of Development Studies* 50, no. 3 (2014): 426–43, https://doi.org/10.1080/00220388.2013.866218.

68 John Kennan and James R. Walker, "The Effect of Expected Income on Individual Migration Decisions," *Econometrica* 79, no. 1 (2011): 211–51, https://doi.org/10.3982/ECTA4657.

69 Kennan and Walker.

70 Kennan and Walker.

Ibarraran and Lubotsky examined census data in the United States and Mexico to compare educational attainments of immigrants versus non-immigrants to the United States.[71] Their research reveals that low-skilled Mexicans are more likely than high-skilled Mexicans to migrate to the United States.[72] Interestingly, they also note a discrepancy in the number of migrants leaving Mexico by regional return on investment from education.[73] Namely, areas of Mexico that had a greater educational return on investment generated more migrants to the United States than areas where the return on investment from education was low.[74] Their research seems to support Borjas's theory that migrants conduct a cost–benefit analysis when choosing to migrate.

However, limitations to this research also emerged. While many of these studies focused solely on legal migration, economic migration is fundamentally different from irregular or forced migration.[75] Economic migrants have time to weigh the costs and benefits of migration, but forced migrants or refugees are displaced by events that put their lives at risk.[76] Their movements are often sudden and unforeseen, decreasing the likelihood they will be conducting an economic analysis ahead of time.[77] This research is also limited in that it assumes migrants are aware of and weigh economic data in the migration decision-making process. This type of in-depth analysis is more difficult to do in places with lower educational levels and limited access to information.

Likewise, researchers such as Schmeidl, Johnson, and Ruyssen acknowledge that economic factors considered in a vacuum do not accurately predict migrant outflows. Johnson's research, for example, reveals that "all countries experiencing a mass-migration

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71 Pablo Ibarraran and Darren Lubotsky, "Mexican Immigration and Self-Selection: New Evidence from the 2000 Mexican Census," Working Paper No. 11456 (Cambridge, MA: National Bureau of Economic Research, 2005), https://doi.org/10.3386/w11456.

72 Ibarraran and Lubotsky.

73 Ibarraran and Lubotsky.

74 Ibarraran and Lubotsky.

75 Christian Dustmann et al., "On the Economics and Politics of Refugee Migration," *Economic Policy* 32, no. 91 (July 2017): 497–550, https://doi.org/10.1093/epolic/eix008.

76 Dustmann et al.

77 Dustmann et al.

event were in (economic) distress; however, not all distressed countries experienced a mass-migration event."[78] Schmeidl, too, maintains that economic variables alone are not enough to effectively predict refugee outflows.[79] Ruyssen points out that network effects also have a strong influence on migrants' decision-making processes, and such effects must be included along with economic analysis to maintain accurate behavioral models. Here, the literature turns to network theory to help explain why some people migrate and others do not.

2. Network Theory

To explain why similarly situated people make different decisions about whether to migrate, researchers have turned to the importance of social connections, such as families, friendships, or cultural associations, in the destination country. This concept is referred to as network theory. Social network theory posits that people are more likely to migrate to places where they have social ties like "kindship, friendship and a shared community origin."[80]

Neto and Mullet expand on the economic theories of migration when they posit that the presence of a social network might influence one's intention to migrate.[81] They have found that the presence of social networks increased not only the likelihood of migration but also the wage differential and the number of employment opportunities in the destination country.[82] This finding is important because it suggests social networks have a compounding effect on migration economics. Moreover, Neto and Mullet argue that any evidence of strong social networks must be included in migration models to enhance their

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[78] Johnson, "Using Maslow's Hierarchy of Needs," 35.

[79] Susanne Schmeidl, "Exploring the Causes of Forced Migration: A Pooled Time-Series Analysis, 1971–1990," *Social Science Quarterly* 78, no. 2 (June 1997): 1.

[80] Graeme Hugo, "Climate Change-Induced Mobility and the Existing Migration Regime in Asia and the Pacific," in *Climate Change and Displacement: Multidisciplinary Perspectives*, ed. Jane McAdam (Oxford: Hart Publishing, 2010), 10, https://digital.library.adelaide.edu.au/dspace/handle/2440/63904.

[81] Felix Neto and Etienne Mullet, "Decision-Making as Regards Migration: Wage Differential, Job Opportunity, and the Network Effect," *Acta Psychologica* 98, no. 1 (March 1998): 57–66, https://doi.org/10.1016/S0001-6918(97)00035-8.

[82] Neto and Mullet.

accuracy.[83] The importance of such social networks is also verified by Ruyssen, Everaert, and Rayp in their examination of immigration flows between European countries. They reiterate the importance of factoring social networks into migration models.[84]

Expanding on the work of Sjaadstad, Gross and Schmitt examine the economics and influencers of international migration by skill level while also factoring in network theory.[85] They assert that for low-skilled workers, having a network of friends, family, and acquaintances combined with relative incomes constitutes the biggest motivator behind international migration.[86] But having a network in the destination country is not the only place where the influence of family is felt in terms of international migration. The new economics of labor migration posits international migration as a family risk-diversification strategy.[87] This body of research posits that intending migrants not only consider their personal economic return on investment for international migration but also weigh the economic impact on family members. This theory helps to explain why some members of a family choose to migrate while others do not.

Building on the cost–benefit analysis frameworks discussed earlier, Stark and Levhari have suggested migration is a risk-reduction strategy. They note that economically vulnerable households may send a family member to an urban or international location for their family to have a diverse stream of income should the originating household experience an economic downturn.[88] This is an important concept in migration literature because it expands the nexus of the migration decision-making process to include the

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[83] Neto and Mullet.

[84] Ilse Ruyssen, Gerdie Everaert, and Glenn Rayp, "Determinants and Dynamics of Migration to OECD Countries in a Three-Dimensional Panel Framework," *Empirical Economics* 46, no. 1 (2014): 175–97, https://doi.org/10.1007/s00181-012-0674-1.

[85] Dominique M. Gross and Nicolas Schmitt, "Low- and High-Skill Migration Flows: Free Mobility versus Other Determinants," *Applied Economics* 44, no. 1 (2012): 1–20, https://doi.org/10.1080/00036846.2010.498365.

[86] Gross and Schmitt.

[87] Oded Stark and David Levhari, "On Migration and Risk in LDCs," *Economic Development and Cultural Change* 31, no. 1 (October 1982): 191–96, https://doi.org/10.1086/451312.

[88] Stark and Levhari.

impact on family members.[89] Migration costs money, and by sharing that cost between family or community members in the country of origin, the financial risk of the migrating family member's not arriving in the country of origin is distributed among the household, again mitigating the risk.[90]

Stark and Bloom expand this new economics theory to the monetary benefits of remittances. When migrants arrive at their destination, the benefits of the migration are distributed among family members in the form of remittances, thus diversifying the income of the group and creating a new and powerful stream of revenue to the originating country.[91] By sending just one relative to migrate, the originating family improves its economic outlook in the form of remittances from the migrating family member. But more recent researchers, such as Winter, have argued that economic factors are not so straightforward. At times, improving economic conditions in the originating country can result in increased emigration because migrants can now afford to make the journey.[92] This is the opposite of findings from earlier research in which the wage differential appeared to be such a motivating factor. Winter acknowledges this dichotomy and suggests that economic conditions in originating countries result in opposing effects.[93] On the one hand, as economic conditions improve, more migrants can afford to emigrate, but on the other hand, there is less economic incentive to do so.[94]

However, there are limitations to and criticisms of this body of research. Other than Central America–based studies, the bulk of this research has been conducted on legal migrant populations. It is unknown whether economic factors are as relevant with an irregular migration population. This body of research has also been criticized for the

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89 Stark and Levhari.

90 Oded Stark and David E. Bloom, "The New Economics of Labor Migration," *American Economic Review* 75, no. 2 (1985): 173–78.

91 Stark and Bloom.

92 Simon Winter, "'It's the Economy, Stupid!': On the Relative Impact of Political and Economic Determinants on Migration," *Population Research and Policy Review* 39, no. 2 (2020): 207–52, https://doi.org/10.1007/s11113-019-09529-y.

93 Winter.

94 Winter.

assumptions researchers make regarding the knowledge and rationality of migrants. It is all well and good to assume that migrants take the time to complete a thorough cost–benefit analysis before migrating, but the odds of someone doing so when fleeing violence or a natural disaster seem much lower.

3. Conflict

Consensus exists in the literature about the significance of armed conflict in refugee outflows. Researchers such as Crawley, Schmeidl, Martineau, and Johnson, among others, have contributed to this body of research.[95] However, opinions vary on what type of conflict causes mass migrations and on whether armed conflict is a driver or a byproduct of other underlying factors, such as border or ethnic disputes, resource scarcity as a result of climate change, or a poor economy.

For example, Schmeidl's research indicates that measures of general violence are more strongly correlated with predictions of migration flows than are institutional human rights violations.[96] She also notes that civil wars in which a foreign military intervenes produce larger and longer migration outflows than do civil wars without outside influence. Turchin argues that conflict is a result of long-term social pressures, and by examining the history of socio-political instabilities and conflicts, it is possible to uncover why and when they occur.[97] Martineau's research indicates that aggregate conflict is associated with an increased risk of a country's producing refugees.[98] Johnson's research indicates that mass migrations are more likely to come from countries involved in conflict.[99] Meanwhile, Moore and Shellman observe that the greater the threat migrants face in their home country,

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[95] Schmeidl, "Exploring the Causes of Forced Migration"; Johnson, "Using Maslow's Hierarchy of Needs."

[96] Schmeidl, "Exploring the Causes of Forced Migration," 1.

[97] Peter Turchin, "Modeling Social Pressures toward Political Instability," *Cliodynamics: Journal of Quantitative History and Cultural Evolution* 4, no. 2 (2013): 241–80, https://doi.org/10.21237/C7CLIO4221333.

[98] Martineau, "Red Flags," 148.

[99] Johnson, "Using Maslow's Hierarchy of Needs," 47.

the greater the number of persons who chose to migrate.[100] Likewise, Crawley has found conflict to be the biggest push factor driving asylees to migrate to the United Kingdom.[101]

4. Proximity

While notable exceptions exist in the literature, the role that proximity plays in migrants' decisions about where to move has been documented throughout migration research. In 1885, Ravenstein established that "the great body of our migrants only proceed a short distance."[102] Stillwell validated this theory in 2016, when he found that migration flows decline with distance. He noted several reasons for this phenomenon, including financial cost, lack of knowledge about more distant destinations, and social costs of moving away from one's location of origin.[103]

Yet there are notable exceptions to this rule. Winders rightly points out that migrants from a range of origin countries have settled far beyond seemingly proximate locations.[104] Stillwell et al. affirm that the more developed a country, the greater the distance migrants are willing to travel to get there.[105] This finding explains why the United States, Germany, and Saudi Arabia—all economic generators—are in the top three countries for most international migrants.[106]

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[100] Will H. Moore and Stephen M. Shellman, "Fear of Persecution: Forced Migration, 1952–1995," *Journal of Conflict Resolution* 48, no. 5 (October 2004): 723–45, https://doi.org/10.1177/0022002704267767.

[101] Heaven Crawley, *Chance or Choice?: Understanding Why Asylum Seekers Come to the UK* (London: Refugee Council, 2010), https://pureportal.coventry.ac.uk/en/publications/chance-or-choice-understanding-why-asylum-seekers-come-to-the-uk.

[102] Ravenstein, "The Laws of Migration."

[103] J. Stillwell et al., "Internal Migration around the World: Comparing Distance Travelled and Its Frictional Effect," *Environment and Planning A: Economy and Space* 48, no. 8 (2016), https://doi.org/10.1177/0308518X16643963.

[104] Jamie Winders, "New Immigrant Destinations in Global Context," *International Migration Review* 48, no. 1 suppl. (Fall 2014): 150, https://doi.org/10.1111/imre.12140.

[105] Stillwell et al., "Internal Migration around the World," 1669.

[106] "Top 25 Destinations of International Migrants," Migration Policy Institute, accessed August 15, 2021, https://www.migrationpolicy.org/programs/data-hub/charts/top-25-destinations-international-migrants.

Despite this area of relative disagreement in the literature, the proximity factor still has value in this thesis. Given that migrants are unlikely to travel a considerable distance from their countries of origin to migrate, countries at a considerable distance from the United States are unlikely to produce migration in numbers sufficient to overwhelm the U.S. immigration system. Therefore, this proximity factor still has value for ascertaining which countries are likely to generate a mass-migration event to the United States. Recent mass migrations to the United States have all originated in countries close to the United States, chiefly Central America and Haiti. Likewise, crises in more distant locations, notably Syria and Venezuela, have produced mass migrations but not to the United States. U.S. immigration authorities should factor in proximity when determining which countries are at risk for mass-migration events.

5. Migration Policy

Changes in the political structure of the originating country can increase the likelihood of a mass migration.[107] Martineau has found that a country achieving independence increases its likelihood of generating refugees by a factor of 15.[108] Likewise, countries that have recently lost their freedom are 15 times more likely to produce refugees.[109] Martineau also claims that political upheaval substantially increases the likelihood of a country's producing refugees.[110]

Emigration policies for the originating countries also appear to play a role in the decision to migrate. The perfect example of this dynamic was the Mariel boatlift, a Cuban mass migration triggered by Castro's opening the port and allowing citizens to leave.[111] Another example is Cambodia in the 1970s and 1980s. During the Khmer Rouge regime, escaping to Thailand was almost impossible, and over one million Cambodians died, but

[107] Ahmed et al., "Data-Driven Mass Migration Analysis."

[108] Martineau, "Red Flags," 147.

[109] Martineau, 147.

[110] Martineau, 147.

[111] Johnson, "Using Maslow's Hierarchy of Needs."

after the Vietnamese invasion, travel became relatively easy, triggering a Cambodian mass migration to Thailand.[112]

Migration policies in destination countries or the perception of those policies can affect migration flows. Whether in rhetoric, changed policies on family and work visas, or physical acts such as closing borders, actions taken by destination countries alter migration flows. This was demonstrated during the mass migration of children in the 2010s when the perception about available *permisos* (permits) in the United States influenced migrants' decisions to cross the border.[113]

However, policies impacting migration patterns change over time, making it difficult to model the impacts of such changes as they cannot be based on past observations. However, researchers can anticipate favorable or unfavorable policy changes in the United States based on changes in administration and rhetoric posed by incoming presidents. For example, Donald Trump frequently used the slogan "build the wall"—referring to a physical barrier between the United States and Mexico—during his 2016 presidential campaign, signaling a more stringent immigration policy was forthcoming should he take office. Migration forecasters can monitor these political trends to anticipate a shift in migration due to a change in presidency.

6. Climate Change

Another factor that will play into mass-migration movements is climate change. Current estimates anticipate that in the coming decades, 24 to 70 million people will be displaced as a result of climate change.[114] DHS's own *Climate Action Plan* warns that the United States could see mass migrations from Mexico, Central America, and the Caribbean

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[112] Clark, *Early Warning of Refugee Flows*, 12.

[113] Gootnick, *Central America*, 6.

[114] Joern Birkmann, Denis Chang Seng, and Neysa Setiadi, "Enhancing Early Warning in the Light of Migration and Environmental Shocks," *Environmental Science & Policy* 27, suppl. 1 (March 2013): S83, https://doi.org/10.1016/j.envsci.2012.04.002.

as a result of climate change.[115] The plan indicates that the United States may need to ready itself for disaster-driven mass-migration events.[116]

The warnings provided in the DHS plan are already coming to fruition. In November 2020, back-to-back hurricanes Eta and Iota ravaged Central America, destroying homes and crops and displacing thousands.[117] Migrant caravans from storm-ravaged regions began forming shortly thereafter and have not yet ceased.[118] The United States could look to countries at risk of climate change as one factor in anticipating mass migrations.

While conducting this literature review, one key gap in knowledge emerged—that international migration cannot be predicted with the accuracy needed to drive decision-making by analyzing social factors alone.[119] Even the most accurate studies tend to predict whether there will be a migration outflow but not necessarily how many will leave or when the outflow will occur.[120] This lack of specificity renders this body of knowledge of little use to decision-makers in need of accurate numbers and timelines to drive response or mitigation efforts. Emerging technologies and advanced modeling are needed to enhance the precision of the migration forecast.

7. Technology

U.S. immigration authorities could use emerging technologies to forecast and track international migration. Academics and aid organizations are tackling this problem from

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115 Department of Homeland Security, *DHS Climate Action Plan* (Washington, DC: Department of Homeland Security, 2013), https://www.dhs.gov/sites/default/files/publications/DHS%20Climate%20Action%20Plan.pdf.

116 Department of Homeland Security.

117 Sarah Marsh and Sofia Menchu, "Storms That Slammed Central America in 2020 Just a Preview, Climate Change Experts Say," Reuters, December 3, 2020, https://www.reuters.com/article/us-climate-change-hurricanes-idUSKBN28D2V6.

118 Maria Verza, "Desperation Grows in Battered Honduras, Fueling Migration," AP News, February 11, 2021, https://apnews.com/article/honduras-hurricane-iota-mexico-storms-immigration-3cf340e556ee767d1dd3dce351c934b5.

119 Susan McGrath and Julie E. E. Young, *Mobilizing Global Knowledge: Refugee Research in an Age of Displacement* (Calgary: University of Calgary Press, 2019), http://hdl.handle.net/1880/111127.

120 Martineau, "Red Flags."

many different angles. Academia, the technology industry, and a few national refugee and science organizations are leading the charge in research on technologies for anticipating mass-migration events. There seems to be wide consensus in scholarly, humanitarian, and government circles on the importance of anticipating and tracking large population movements for humanitarian and security purposes.[121] The importance of establishing this ability was even recognized in the 2018 Global Compact on Refugees.[122] Thus far, however, there has been little consensus on which technologies might best accomplish this goal.[123]

This section assesses several of the most promising areas of emerging technology that may prove useful in anticipating migratory flows, such as satellite imagery, internet search analysis, social-media analysis, and cell-phone tower tracking. Each of these categories has scholars advocating its use. Some scholars, such as Mary Dysart, advocate the use of satellite imagery to sense population movement and in-country stressors, such as food and water insecurity and crop failures, that likely compel people to migrate.[124] Others, including Marcus Böhme, André Gröger and Tobias Stöhr, advocate the use of internet search analysis to forecast international migrations.[125] Another camp, including Susan Martin and Lisa Singh, highlight the use of combined social-media analysis.[126] Still others, Linus Bengtsson and Xin Lu, for example, recommend cell-phone tower tracking as the best method.[127]

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[121] McGrath and Young, *Mobilizing Global Knowledge*.

[122] McGrath and Young.

[123] McGrath and Young.

[124] Mary D. Dysart, "Remote Sensing and Mass Migration Policy Development" (master's thesis, Air War College, 2011).

[125] Marcus H. Böhme, André Gröger, and Tobias Stöhr, "Searching for a Better Life: Predicting International Migration with Online Search Keywords," *Journal of Development Economics* 142 (January 2020): 102347, https://doi.org/10.1016/j.jdeveco.2019.04.002.

[126] Lisa Singh et al., "Blending Noisy Social Media Signals with Traditional Movement Variables to Predict Forced Migration," in *Proceedings of the 25th International Conference on Knowledge Discovery & Data Mining* (New York: Association for Computing Machinery, 2019), 1975–83, https://doi.org/10.1145/3292500.3330774.

[127] Linus Bengtsson et al., "Improved Response to Disasters and Outbreaks by Tracking Population Movements with Mobile Phone Network Data: A Post-Earthquake Geospatial Study in Haiti," *PLOS Medicine* 8, no. 8 (2011): e1001083, https://doi.org/10.1371/journal.pmed.1001083.

a. Satellite Imagery

Data from satellite imagery can be used to identify and predict worldwide threats to human survival that could trigger mass migration.[128] Proponents of the use of this technology in forecasting international migration, such as Mary Dysart in her thesis for the Air War College, note that scientists can use satellites to detect water scarcity, disease, and crop failure.[129] Analyzing the strain on food or water supplies could help U.S. immigration authorities determine where the next mass migration is likely to come from. However, critics of this technology point out that not all countries experiencing these ecological strains also experience mass migrations. Therefore, satellite imagery alone is not enough to accurately predict mass migrations.

b. Social-Media Analysis

Lisa Singh has pioneered the field of data analytics for migration analysis by mixing social-media analysis, specifically from Twitter, with traditional newspaper analysis. In this seminal work, she has demonstrated that social-media keyword analysis when conducted in the native language can improve migration forecasting accuracy. This study lays the groundwork for future work on social-media data-mining.[130]

However, Singh's critics have correctly pointed out that her lengthy and labor-intensive searches of Twitter feeds have only slightly improved predictions over newspaper analysis alone. They reason that Twitter is used only by a small portion of the population in any country and, thus, is likely to miss older demographics. Also, her research took years to conduct and was finalized long after any migration movement had taken place, thus limiting its usefulness for anticipating mass-migration events.[131] While this thesis recognizes that social-media analysis has the potential to anticipate mass-migration flows, due to the constraints, it does not examine social-media analysis as a viable method for anticipating mass-migration flows at this time.

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[128] Dysart, "Remote Sensing and Mass Migration Policy Development."

[129] Dysart.

[130] Singh et al., "Blending Noisy Social Media Signals."

[131] Singh et al.

c. Internet Search Analysis

In contrast, advocates of forecasting migration using internet search analysis, such as Marcus Böhme and Allen Lin, have predicted international and domestic migration in advance using this method with a promising degree of accuracy.[132] This technology is inexpensive, fast, and easy to use. It also acts as a reliable leading indicator that migration is imminent and, therefore, has drawn little criticism by fellow scholars. This technology could prove promising in forecasting international migration to the United States.

d. Cell-Phone Tower Tracking

Some scholars have begun using cell-phone tower tracking to assist in determining migration movements.[133] Research being conducted in a variety of countries, most notably by the Danish Refugee Counsel, is showing that more and more, cell phones are a vital tool for international migrants.[134] Researchers such as Bengtsson et al. note the usefulness and accuracy of this technology in tracking migration movements in real time to direct humanitarian resources to the migrants who need them.[135] However, Bengtsson et al. admit the limitations of this approach in that some populations will be underrepresented using this technology alone—for example, children and elderly people are less likely to carry cellular phones.[136] This research is also limited because, so far, such technology has been used only for tracking in-country migration. Navigating the use of such technologies across borders may present insurmountable challenges and has not yet been accomplished. Still, the potential posed by such technology warrants inclusion in this literature review. Figure 2 depicts the combined technological methods for anticipating mass migrations, as proposed in this thesis.

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[132] Böhme, Gröger, and Stöhr, "Searching for a Better Life."

[133] Bengtsson et al., "Improved Response to Disasters and Outbreaks."

[134] Bram Frouws et al., *Getting to Europe the Whatsapp Way: The Use of ICT in Contemporary Mixed Migration Flows to Europe* (Nairobi: Regional Mixed Migration Secretariat, 2016), https://doi.org/10.2139/ssrn.2862592.

[135] Bengtsson et al., "Improved Response to Disasters and Outbreaks."

[136] Frouws et al., *Getting to Europe the Whatsapp Way*.

Figure 2. Technology for Mass-Migration Anticipation

8. Conclusion

From this literature review, several limitations in the literature have emerged. First, much of this research has been conducted in a vacuum, and few scholars have taken a multi-disciplinary approach to migration forecasting. Social scientists, economists, computer scientists, and demographers have examined the challenges from their limited perspectives. However, if these groups were to combine forces and their disciplinary knowledge, the body of research would likely expand exponentially.

Second, little research has been conducted by practitioners in the field, such as border and immigration officials. Immigration practitioners are at the front lines of responding to mass-migration events. They may have valuable knowledge and insights that can be used to direct research that proves useful in shaping policy and guiding decision-makers. The lack of contributions by such practitioners reflects a limitation within the research. Nevertheless, one example of a practitioner conducting valuable research is

Katelin Wright.[137] An immigration services officer with CIS, her insight into the effect of climate change on mass migration and the practical solutions in preparing for such events represent a bright spot within the literature. Greater research from the practitioner's perspective would be helpful in terms of growing this body of knowledge.

Third, regarding technological methods, research on technology and migration is limited by the lack of internet use in originating countries. Nevertheless, as internet and cell-phone use increase worldwide, so will the accuracy of these analyses. Another gap is that each study seems to explore only one technology in mass-migration forecasting. No one has combined the technologies available to devise a comprehensive plan to increase the accuracy of such predictions.

In conclusion, the importance of anticipating mass-migration events has been well established. However, research on the use of technology in anticipating mass-migration events is in its infancy. The U.S. government must collaborate with researchers, technology companies, and aid organizations focusing on technology to anticipate mass-migration events more accurately.

F. RESEARCH DESIGN

The purpose of this thesis is to explore ways for the U.S. government to improve its foresight capacity to anticipate and manage mass-migration events. To show that migration forecasting is possible, this thesis references research that establishes baseline patterns for aiding future analysis. It first examines the different push-pull factors that drive migration and then discusses data that could be used to quantify such migration stressors. Next, with an eye to accuracy and the potential as leading indicators, the thesis explores technologies that could be used to improve the precision of migration forecasts, such as internet search analysis, satellite imagery, and cell-phone tower data. These technologies were chosen because they have shown promising results in forecasting mass-migration events. Then, the thesis presents modeling techniques that could synthesize these data points and technologies to anticipate mass-migration flows accurately. These modeling

[137] Katelin M. Wright, "The Perfect Storm: Climate-Induced Migration to the United States" (master's thesis, Naval Postgraduate School, 2020), http://hdl.handle.net/10945/66051.

techniques represent those used in studies that most accurately forecasted a mass-migration event. Notably, this thesis focuses not on the means of conducting mass-migration forecasts but on the feasibility of anticipating mass migrations.

Next, complementary analysis incorporates strategic forecasting into U.S. immigration processes. The penultimate chapter examines strategic forecasting and future-planning units across governments to determine best practices in forming such a unit with a U.S. immigration nexus. The criteria used to examine these planning units include accuracy of forecasting, labor intensiveness of the process used, and their ability to provide leading indicators of mass-migration events.

Finally, based on the analysis, the final chapter proposes ways to incorporate a strategic foresight unit into DHS to oversee the immigration planning process. These recommendations involve the various entities responsible for mass-migration response—ICE, CBP, CIS, the Executive Office of Immigration Review, the ORR, the Department of Defense, the State Department, and others—to leverage a coordinated, whole-of-government response. The thesis concludes by detailing a plan for the U.S. government to improve its foresight capacity to anticipate and manage mass-migration events.

II. FORESEEING MASS-MIGRATION FLOWS

Strategic planning allows analysts to look "beyond the vision of the operating officers caught in the smoke and crises of current battle; far enough ahead to see the emerging form of things to come and outline what should be done to meet or anticipate them."[138] Strategic foresight work involves a broad scope of activities aimed at producing knowledge about possible futures: "The goal is to create an evidence base to lead strategic planning."[139] It uses strategies such as trend impact analysis, horizon scanning, early-warning systems, scenario planning, and the Delphi method.

Trend impact analysis uses historical data to make predictions about the future while taking unprecedented events into account.[140] It investigates possible future events that could affect the trend being examined.[141] This method utilizes expert opinions to identify future events that might change the projected trend and then calibrates the likelihood and magnitude of such events, thus providing a basis for scenario building.[142]

Horizon scanning, by contrast, aids in assessing whether an agency is prepared for future challenges or threats.[143] It involves bringing a group of experts together to discuss a common problem and arrive at solutions.[144] As described by the National Academies of Sciences, Engineering, and Medicine, horizon scanning involves a cyclical process of

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[138] J. Peter Scoblic, "We Can't Prevent Tomorrow's Catastrophes Unless We Imagine Them Today," *Washington Post*, March 18, 2021, https://www.washingtonpost.com/outlook/2021/03/18/future-forecasting-strategic-planning/.

[139] Iana Dreyer and Gerald Stang, "Foresight in Governments—Practices and Trends around the World," in *YES 2013: EUISS Yearbook of European Security*, ed. Antonio Missiroli (Paris: European Union Institute for Security Studies, 2013), 13, https://www.iss.europa.eu/content/euiss-yearbook-european-security-2013.

[140] Dreyer and Stang, 11.

[141] Dreyer and Stang, 11.

[142] Dreyer and Stang, 11.

[143] National Academies of Sciences, Engineering, and Medicine, "Horizon Scanning and Foresight Methods," in *Safeguarding the Bioeconomy* (Washington, DC: National Academies Press, 2020), 233–71, https://doi.org/10.17226/25525.

[144] National Academies of Sciences, Engineering, and Medicine.

"scanning, analyzing, synthesizing and communicating information."[145] Ultimately, horizon scanning strives to detect early signs of important developments by systematically examining potential opportunities and threats.[146]

Similarly, scenario planning involves analyzing how a current situation may develop, or what could transpire in the future given current factors.[147] Contingency planning falls under the umbrella of scenario planning and involves gathering a group of agencies together to plan a potential response for a specific mass-migration scenario.[148] Contingency planning assists in identifying resource gaps before the actual event occurs, decreasing the time needed to develop a response to the mass-migration event.[149]

The Delphi method was developed by the RAND Corporation, a think tank in the United States.[150] It involves using structured brainstorming among experts to make predictions about different trends pertaining to an issue. This method often involves sending out questionnaires to the experts to minimize their interactions and using a monitor to filter the analyses to identify trends.[151] These questionnaires collect numeric data that can be used for quantitative analysis.[152]

Early-warning systems involve collecting and analyzing information, building scenarios based on that information, and recommending options for preventative action and

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145 National Academies of Sciences, Engineering, and Medicine, 233.

146 Dreyer and Stang, "Foresight in Governments," 10.

147 Lars Wicke et al., "Using Scenarios to Forecast Outcomes of a Refugee Crisis," *International Journal of Forecasting* (2019): 1, https://doi.org/10.1016/j.ijforecast.2019.05.017.

148 Stephen M. Shellman and Brandon M. Stewart, "Predicting Risk Factors Associated with Forced Migration: An Early Warning Model of Haitian Flight," *Civil Wars* 9, no. 2 (2007): 174, https://doi.org/10.1080/13698240701207344.

149 Shellman and Stewart, 174.

150 Dreyer and Stang, "Foresight in Governments," 3.

151 Dreyer and Stang, 10.

152 Eduardo Acostamadiedo and Jasper Dag Tjaden, "Forecasting the Future of Migration—Many Approaches, One Commonality: Uncertainty," *Migration Data Portal* (blog), April 16, 2020, http://migrationdataportal.org/blog/forecasting-future-migration-many-approaches-one-commonality-uncertainty.

interventions.[153] Early-warning systems for mass migration decide on a set of warning signs that a mass migration is likely and then establish thresholds that indicate a mass migration is imminent.[154] Once such thresholds are met, a set of predetermined actions are triggered.[155] The United Nations notes that early-warning systems describe the "set of capacities needed to generate and disseminate timely and meaningful warning" information for organizations to prepare and act appropriately and in sufficient time to reduce the possibility of harm or loss.[156] These systems aim to anticipate threats against the state or against human integrity and livelihood.[157] As the International Organization for Migration describes, "Early warning systems are a useful tool to react to situations on the ground and preemptively commit or reallocate resources."[158] These systems integrate four specific elements: knowledge of the risks, a technical monitoring and warning service, dissemination of warnings, and responses dependent on awareness and preparedness (see Figure 3).[159]

153 Susanne Schmeidl, "The Early Warning of Forced Migration: State or Human Security?," in *Refugees and Forced Displacement: International Security, Human Vulnerability, and the State*, ed. Edward Newman and Joanne van Selm (Tokyo: United Nations University Press, 2003), 2, https://collections.unu.edu/eserv/UNU:2434/nLib9280810863.pdf.

154 Acostamadiedo and Tjaden, "Forecasting the Future of Migration."

155 Acostamadiedo and Tjaden.

156 Birkmann, Chang Seng, and Setiadi, "Enhancing Early Warning," S77.

157 Schmeidl, "The Early Warning of Forced Migration," 2.

158 Acostamadiedo and Tjaden, "Forecasting the Future of Migration."

159 Birkmann, Chang Seng, and Setiadi, "Enhancing Early Warning," S77.

Figure 3. The Four Elements of an Effective Early-Warning System Framework.[160]

The United States currently has an early-warning system in place for maritime mass migrations in the Caribbean. The currently active Homeland Security Task Force Southeast oversees mass migration through the Caribbean.[161] The Task Force works together on a near-daily basis to look for indicators of Caribbean mass migration.[162] This system allows for quick activation of the maritime mass-migration plan once indicators meet

[160] Source: Denis Chang Seng, "Disaster Risk Preparedness" (PhD diss., Rhenish Friedrich Wilhelms University, 2010), https://bonndoc.ulb.uni-bonn.de/xmlui/handle/20.500.11811/4629.

[161] "Secretary Mayorkas Overviews U.S. Maritime Migrant Interdiction Operations," Department of Homeland Security, July 13, 2021, https://www.dhs.gov/news/2021/07/13/secretary-mayorkas-overviews-us-maritime-migrant-interdiction-operations.

[162] Bridget Johnson, "DHS, Military Train for Possibility of Mass Migration by Sea—Homeland Security Today," Homeland Security Today, April 18, 2019, https://www.hstoday.us/subject-matter-areas/border-security/dhs-military-train-for-possibility-of-mass-migration-by-sea/.

preestablished thresholds.[163] As discussed previously, no such entity or early-warning system exists for mass migrations from the southwest border.

Foresight works involves weighing an array of options and overcoming analytical challenges. There are two different ways to approach foresight work: normative foresight asks which future scenarios are desirable, and exploratory foresight examines what is possible regardless of desirability.[164] There are also two different ways to gather information for use in strategic foresight. The first is qualitative foresight work, which involves conducting interviews and discussions and examining reports.[165] The second is quantitative foresight work, which involves looking at figures and statistics. These methods can be combined to give a more varied examination of what a future scenario might look like.[166] Furthermore, strategic forecasting faces four main challenges: data availability, issue complexity, analytic processes, and institutional constraints.[167] This discussion now turns to overcoming these challenges to make anticipating migration flows a reality.

A. PUSH-PATH-PULL ANALYSIS

Historically, illegal migration has been difficult to predict. For decades the preeminent theory relating to migration patterns has revolved around push-pull theory.[168] As Clair Apodaca points out, "In order to anticipate, assist, or prevent refugee flight, we need to identify and monitor those causes and triggering events of flight."[169] "Push" refers to factors that drive migrants to leave their country of origin, for example, violence, famine, natural disaster, or lack of economic activities. "Pull" refers to factors that draw migrants to a host country, such as having family members in that community or better economic

163 Johnson.

164 Dreyer and Stang, "Foresight in Governments," 11.

165 Dreyer and Stang, 11.

166 Dreyer and Stang, 11.

167 Thomas Juneau, *Strategic Analysis in Support of International Policy Making* (Lanham, MD: Rowman & Littlefield, 2017), 60.

168 "Home Page," Global Food Security Index, accessed August 15, 2021, http://foodsecurityindex.eiu.com/.

169 Clair Apodaca, "Human Rights Abuses: Precursor to Refugee Flight?," *Journal of Refugee Studies* 11, no. 1 (1998): 81, https://doi.org/10.1093/jrs/11.1.80.

opportunities. A more recent addition to the theory is the path variable—"path" relating to whether and how migrants get to the destination country (see Figure 4). Some examples include distance, the presence of organized smuggling routes, and terrain. See Figure 5 for a depiction of the world's busiest migration routes.

Figure 4. Classic Push-Path-Pull Diagram[170]

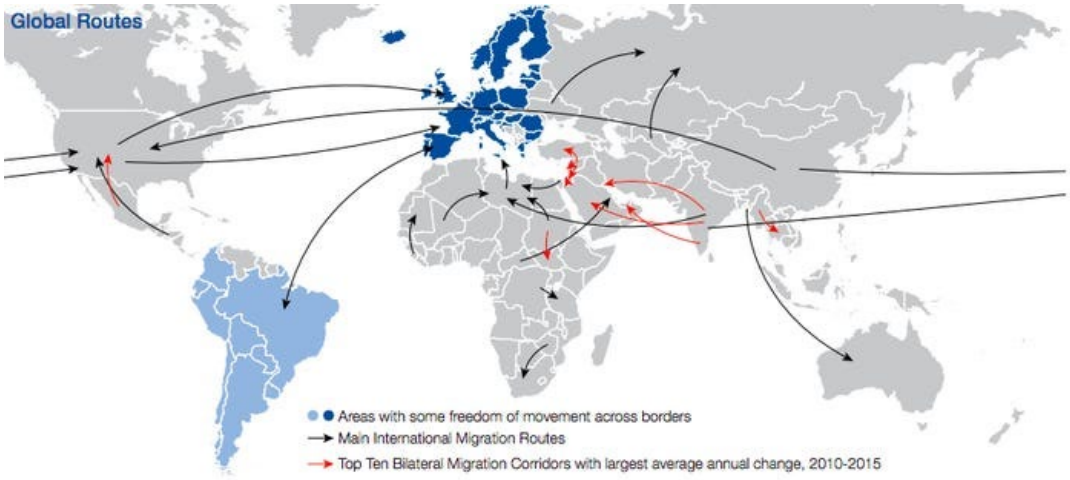

Figure 5. The World's Busiest Migration Routes[171]

Another factor in some mass migrations is a triggering event. While not always present, the triggering event—such as a natural disaster or a change in policy that makes the receiving country seem more welcoming—turns a migration into a mass migration. This factor often ups the pressure from a trickle to a massive flow. Figure 6 better illustrates the many nuances of the factors behind migration.

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[170] Source: Johnson, "Using Maslow's Hierarchy of Needs," 8.

[171] Source: Camilla Hodgson, "World Economic Forum: The World's Most Popular Migrant Routes, in Maps," Business Insider, December 26, 2017, https://www.businessinsider.com/worlds-most-popular-migrant-routes-in-maps-2017-12#central-america-3.

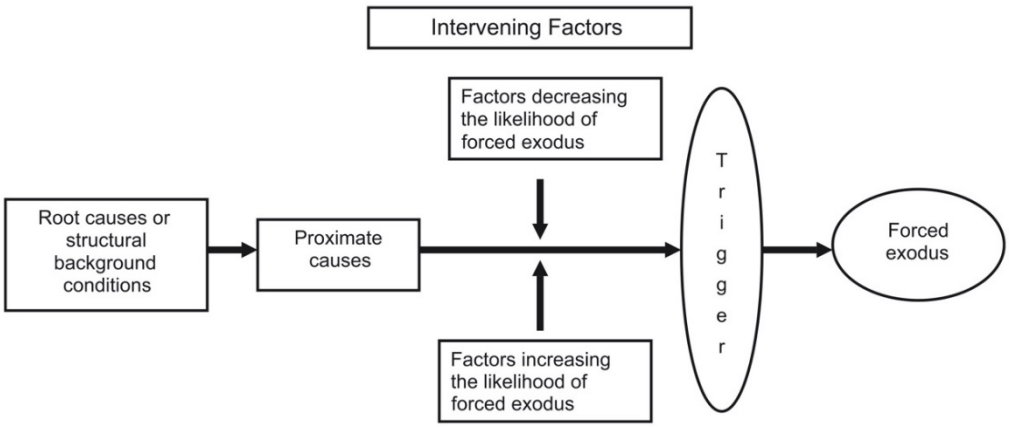

Figure 6. Expanded Push-Path-Pull Diagram[172]

An examination of the literature—particularly on push-pull factors—helps to determine whether mass migrations can be predicted. Researchers have been writing about the causes of migration for more than a century, and their analyses of historical mass migrations reveal commonalities in among the push-path-pull factors.[173] However, this research also acknowledges the complexity in the reasons behind migration and the difficulty in quantifying those reasons.[174]

The research examining early-warning systems for mass migration is much more promising. The goal of such early-warning systems is to sound the alarm when the chance of a refugee outflow in the near future increases.[175] Using an early-warning system that he developed, Martineau has "correctly predict [ed] whether or not a country produced refugees 90.6% of the time."[176] However, Martineau maintains that his early-warning system could become even more accurate if additional variables were considered.

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[172] Source: Schmeidl, "The Early Warning of Forced Migration," 134.

[173] Johnson, "Using Maslow's Hierarchy of Needs," 8.

[174] "Future Migration Trends," Migration Data Portal, October 20, 2020, http://migrationdataportal.org/themes/migration-forecasting.

[175] Martineau, "Red Flags," 136.

[176] Martineau, 147.

Reginald Johnson has examined push-pull factors through the lens of Maslow's hierarchy of needs. Johnson draws similarities between the reasons behind mass migrations and the unfulfilled needs of a populace. As Maslow's hierarchy of needs has been validated extensively and found relevant worldwide, this is a helpful lens for examining the push-path-pull factors of illegal migration (see Figure 7).[177] The following sections examine the push-path-pull factors of migration through this lens, with the aim of improving the accuracy of mass-migration predictions.

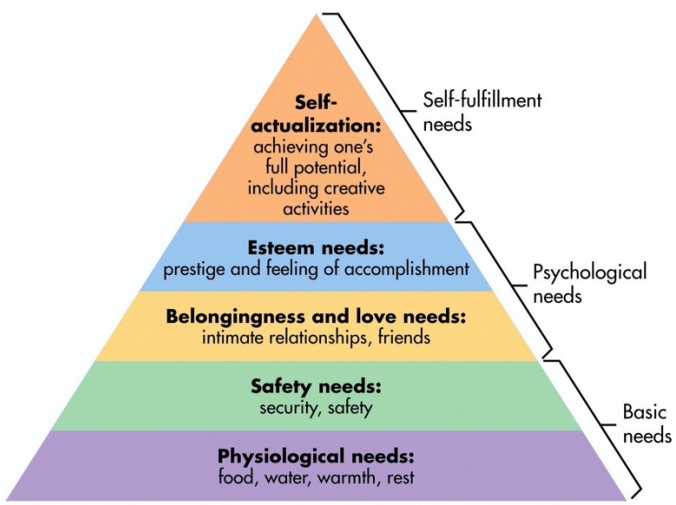

Figure 7. Maslow's Hierarchy of Needs[178]

B. PUSH FACTORS

In conducting an analysis of mass migrations dating back to the 1800s, Johnson has determined "the reasons for migration have not changed. Physiological, safety and economic needs still dominate the reason migrants migrate."[179] Common push factors include famine, war, natural disasters, and more recently, gangs and crime problems. The

[177] Louis Tay and Ed Diener, "Needs and Subjective Well-Being around the World," *Journal of Personality and Social Psychology* 101, no. 2 (August 2011): 354–65, https://doi.org/10.1037/a0023779.

[178] Source: Saul Mcleod, "Maslow's Hierarchy of Needs," Simply Psychology, December 29, 2020, https://www.simplypsychology.org/maslow.html.

[179] Johnson, "Using Maslow's Hierarchy of Needs," 47.

United States witnessed some of these factors in migrants following World War II and during the great potato famine in Ireland.[180] The following subsections examine how one could measure and quantify the needs in Maslow's hierarchy to analyze which countries fail to meet the basic needs of their people, thereby guiding the analysis to countries at greatest risk of mass migration.

1. Physiological Needs

The first tier on Maslow's hierarchy of needs focuses on physiological needs, and for good reason. One cannot survive without the necessities of food, water, and shelter. Therefore, the inability to survive in a country of origin is likely to lead to international migrations. The paragraphs that follow analyze basic physiological needs and discuss how the U.S. government could examine unmet needs in each area.

a. Food

Human beings cannot survive without food, so it comes as no surprise that famine has been the cause of mass migrations dating back centuries.[181] As climate change worsens and desertification continues, food insecurity is likely to become a more significant problem.[182] Food insecurity can be measured using the global food insecurity index, which examines the availability, quality, and affordability of food across 113 countries.[183] This index ranks countries in terms of food insecurity and separates them into four categories: best performance, good performance, moderate performance, and needs improvement. Bangladesh and Honduras, two countries experiencing increases in emigration, are listed in the moderate-performance category while Venezuela ranks last in the index with a needs-improvement score.[184] India, whose numbers of illegal migrants apprehended at the

[180] Johnson, 14, 21.

[181] Johnson, 14.

[182] Dysart, "Remote Sensing and Mass Migration Policy Development."

[183] Global Food Security Index, "Home Page."

[184] Global Food Security Index.

southwest border have spiked in recent years, is listed in the moderate-performance category.[185]

However, there are other ways to measure food insecurity. One could use open-source satellite imagery to detect which countries are experiencing crop failure or desertification that will lead to future crop failure.[186] The Sentinel constellation of the European Space Agency has such satellite imagery available, as do other private-sector companies such as Planet and Digital Globe.[187] Researchers within the agricultural sphere have used satellite imagery to predict the presence of crops like corn and their output with a high degree of accuracy.[188] There is the potential here for U.S. immigration authorities to use this data to determine which countries are experiencing food insecurity and are at higher risk of a mass migration.

b. Water

Access to fresh drinking water is a basic human need. Yet, due to global warming, countries are experiencing a growing level of water stress.[189] According to Schmeidl, in her paper discussing remote-sensing and mass-migration policy development, "the UN had predicted that by 2050, water deficits would affect in excess of 2 billion people in 48 nations."[190] The United States could examine worldwide water stress to better evaluate countries at risk of mass migrations.[191] The United States is seeing an increase in immigration from several countries listed, including Eritrea and India, in the extremely high water-stress rankings compiled by the World Resources Institute. The U.S. is also

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185 Global Food Security Index, "Home Page"; U.S. Customs and Border Protection, "U.S. Border Patrol Nationwide Apprehensions by Citizenship and Sector."

186 Dysart, "Remote Sensing and Mass Migration Policy Development," 11.

187 Marshall Burke and David Lobell, "Using Satellites to Understand and Improve Food Security," *Agrilinks* (blog), May 2, 2019, https://www.agrilinks.org/post/using-satellites-understand-and-improve-food-security.

188 Burke and Lobell.

189 Dysart, "Remote Sensing and Mass Migration Policy Development," 9.

190 Dysart, 10.

191 Animesh K. Gain, Carlo Giupponi, and Yoshihide Wada, "Measuring Global Water Security towards Sustainable Development Goals," *Environmental Research Letters* 11, no. 12 (December 2016): 124015, https://doi.org/10.1088/1748-9326/11/12/124015.

experiencing an increase in unlawful immigration from countries experiencing high baseline water stress, including Mexico, Burkina Faso, Eritrea, and India.[192] Examining countries with growing water stress could be a good place to start in evaluating migration to the United States.

c. Economics/Inability to Earn a Living Wage

If a country is struggling financially, it may not fulfill the basic needs of the populace. Economic woes that rise to a level where people cannot buy food or pay for shelter can be a push factor driving out large numbers of people. Not surprisingly, Johnson has found that mass migrations have originated only from countries with a low per capita gross domestic product.[193] This is one area in which the United States could quickly eliminate large numbers of originating countries at risk for mass migration in its migration planning.

But Johnson is not the only researcher to note the correlation between economics and migration. Economic factors have played a strong role in mass migrations throughout history. They appear to have been a factor during the mass migrations of children and family units in the 2010s. According to Word Bank data from 2011, a significant proportion of Hondurans, Guatemalans, and Salvadorans live below the poverty level (see Figure 8).[194] Examining economic conditions in originating countries could help gain valuable information on which countries are most at risk for mass migration.

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[192] Customs and Border Protection, "Nationwide Apprehensions by Citizenship and Sector." India has been included in the discussion because while the number of Indian nationals apprehended by Customs and Border Protection decreased slightly in 2019, it had increased nearly threefold from 2017 to 2018 and has not returned to baseline levels.

[193] Johnson, "Using Maslow's Hierarchy of Needs," 36.

[194] Gootnick, *Central America*.

Figure 8. Heat Map of Poverty Rates in Central and South America[195]

One way to measure the poverty level of a country is through its gross domestic product, the standard indicator for tracking the health of a nation's economy. This is readily available information published yearly by the World Bank. However, gross domestic product data can, at times, be misleading. For example, both Bangladesh and Venezuela rank in the top 50 percent of countries in per capita gross domestic product, yet both are experiencing increases in migration to the United States.[196] In order to gain a better picture of overall economic health, additional economic data points are needed.

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[195] Source: "Poverty Rate by Country 2021," World Population Review, accessed July 22, 2021, https://worldpopulationreview.com/country-rankings/poverty-rate-by-country.

[196] "GDP Ranked by Country 2020," World Population Review, accessed July 11, 2020, https://worldpopulationreview.com/countries/countries-by-gdp/.

Another way to measure economic viability is through a country's unemployment rate, which is widely available online. Currently, Burkina Faso, a country experiencing an increase in illegal migration to the United States, is ranked worst in the world with a 77 percent unemployment rate.[197] Haiti is also listed in the bottom 10, with a 40 percent unemployment rate.[198] Venezuela appears in the bottom 20, with a 26.4 percent unemployment rate (see Figure 9).

Figure 9. Heat Map of Unemployment Rates in Central and South America[199]

197 "Unemployment by Country 2020," World Population Review, accessed July 11, 2020, https://worldpopulationreview.com/country-rankings/unemployment-by-country.

198 World Population Review.

199 Source: World Population Review, "Unemployment by Country 2020."

Another way to measure economic viability is with inflation levels, which reflect the annual percentage rise in the cost of living in a country. This metric is important as it can indicate how much the cost of living is outpacing wages. Here, Venezuela takes the top spot for the highest inflation in the world with an eye-opening 19,906 percent inflation rate.[200] Haiti is also in the top 10 with 17.3 percent inflation.[201] Looking at countries' economies through several metrics can better gauge which ones are experiencing economic difficulties at a level that could begin to trigger international migration.

2. Safety and Security Needs

Next on Maslow's hierarchy of needs comes safety, which encompasses security as well. Safety and security needs relate to such factors as war, conflict, crime, corruption, and the inability of a country to protect its citizens from harm. This is an area where measurable data and markers are plentiful.

a. War/Conflict

Numerous studies have indicated that conflict is strongly correlated to refugee outflow: the larger the conflict, the greater the chance of refugee outflow. One can measure a country's level of conflict using the Uppsala Conflict Data Program and the Peace Research Institute's data on the presence of conflict in a country.[202] The former, based out of a Swedish university, is the oldest ongoing data project measuring armed conflict worldwide and is the global community's foremost provider of data on organized violence.[203]

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200 "Inflation Rate, Average Consumer Prices," International Monetary Fund, accessed August 15, 2021, https://www.imf.org/external/datamapper/PCPIPCH@WEO.

201 International Monetary Fund.

202 Johnson, "Using Maslow's Hierarchy of Needs," 29.

203 "About UCDP," Uppsala University, accessed August 23, 2021, https://www.pcr.uu.se/research/ucdp/.

b. Crime/Corruption

In evaluating crime's role in migration outflow, it is crucial to examine not only the crime levels in a country but also the ability of a country to protect its citizens from crime. Research has found that both are indicators of refugee outflow.[204] One possible measure of meeting security needs is a country's number of homicides. This factor appears to have played a strong role in the mass migrations of Central American children and family units in the 2010s. For example, El Salvador, Guatemala, and Honduras all recorded homicide rates among the top five in the world as well as the most migrants entering the United States during the child migration.[205]

Often a person's perception of crime or corruption is more important than the numbers themselves.[206] Such data are relatively easy to assemble as they are publicly available via Transparency International's website.[207] Transparency International is a global non-governmental organization that examines and reports on corruption and people's perceptions of it worldwide. Johnson has found that the corruption perception index has the third strongest correlation to refugee outflow.[208] Likewise, during the mass migrations of the 2010s, the three top origination countries—Honduras, Guatemala, and El Salvador—scored poorly on the corruption perception index.[209]

3. Belongingness and Love Needs

While Johnson has not explored belongingness and love needs in much depth, plenty of other researchers have examined the influence of family and social connections on the decision to migrate. For example, Jorge Durand and Douglas Massey have spent

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[204] Johnson, "Using Maslow's Hierarchy of Needs," 30.

[205] Gootnick, *Central America*.

[206] Johnson, "Using Maslow's Hierarchy of Needs," 11.

[207] "Home Page," Transparency International, accessed June 24, 2020, https://www.transparency.org/en/.

[208] Johnson, "Using Maslow's Hierarchy of Needs," 30.

[209] Gootnick, *Central America*.

decades examining these factors as part of the Mexican Migration Project.[210] This project is a binational, longitudinal research project studying Mexican migration to the United States and examining a range of factors that influence migration between the two countries.[211] Massey's research demonstrates that simply knowing someone who has migrated increases the likelihood a person will migrate.[212] Nevertheless, beyond influencing the decision to migrate, social factors influence which routes migrants take and the steps they take to get there.[213] However, belongingness and love needs are more a pull than a push factor, so this thesis examines them further in the section on pull factors.

4. Esteem Needs and Self-Actualization

In ascending Maslow's hierarchy, it becomes more difficult to quantify push factors. For this reason, this section combines the top-two tiers. The human development index, a metric developed by the United Nations Human Development Programme, relates to both esteem needs and self-actualization. According to its website, the index "is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable, and have a decent standard of living."[214] In other words, it measures whether people in a country can live a fulfilling life in which they achieve their potential. In Johnson's analysis, he observes that low scores on the index for a country have the second-strongest correlation to refugee outflow.[215]

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210 "Home Page," Mexican Migration Project, accessed May 15, 2021, https://mmp.opr.princeton.edu/.

211 Mexican Migration Project.

212 Douglas S. Massey and Rene M. Zenteno, "The Dynamics of Mass Migration," *Proceedings of the National Academy of Sciences* 96, no. 9 (1999): 5329, https://doi.org/10.1073/pnas.96.9.5328.

213 Amira Al-Khulaidy and Melanie Swartz, "Along the Border: An Agent-Based Model of Migration along the United States–Mexico Border," in *Proceedings of the 2020 Spring Simulation Conference* (Fairfax, VA: Society for Computer Simulation International, 2020).

214 "Human Development Index (HDI)," United Nations Human Development Programme, accessed August 15, 2021, http://hdr.undp.org/en/content/human-development-index-hdi.

215 Johnson, "Using Maslow's Hierarchy of Needs," 30.

5. Climate Change

Climate change is increasingly being recognized as a contributor to migration flows. According to Abrahm Lustgarten, "Climate is rarely the main cause of migration…but it is almost always an exacerbating one."[216] It has the potential to worsen migration stressors at almost any tier of Maslow's hierarchy of needs. Researchers such as Lustgarten, Feng, Krueger, and Oppenheimer have examined the potential effects of climate change on migration.[217]

As climate change continues and temperatures increase, land will become uninhabitable, and people will be forced to move.[218] Chi Xu et al. have coined the term "climate niche" to describe the temperature range and area with arable land for farming within which the majority of humans have been living for the last 6,000 years.[219] As a result of global warming, the researchers estimate that by 2070, one-third of people in the world will be living outside the climate niche, thus threatening their health and survival.[220] As land becomes uninhabitable, migrants may have no choice but to leave their home countries. Researchers estimate that in the coming decades, between 24 million and 700 million people will be displaced as a result of climate change.[221]

But climate change is not just a future migration concern—it is already affecting migration patterns around the world. One notable example is Syria. Climate change–induced droughts in Syria are believed to be a contributing factor in that country's refugee

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216 Abrahm Lustgarten, "Where Will Everyone Go?," ProPublica, July 23, 2020, https://features.propublica.org/climate-migration/model-how-climate-refugees-move-across-continents/.

217 Lustgarten, "Where Will Everyone Go?"; Shuaizhang Feng, Alan B. Krueger, and Michael Oppenheimer, "Linkages among Climate Change, Crop Yields and Mexico–US Cross-Border Migration," *Proceedings of the National Academy of Sciences* 107, no. 32 (2010): 14257–62, https://doi.org/10.1073/pnas.1002632107.

218 Lustgarten, "Where Will Everyone Go?"

219 Chi Xu et al., "Future of the Human Climate Niche," *Proceedings of the National Academy of Sciences* 117, no. 21 (2020): 11350–55, https://doi.org/10.1073/pnas.1910114117.

220 Chi et al.

221 Birkmann, Chang Seng, and Setiadi, "Enhancing Early Warning," S83.

crisis.[222] Syria had experienced years of droughts and crop failure before the civil war. Then, unable to farm the land, rural Syrians flooded into the cities in search of work, resulting in overcrowding and high unemployment.[223] While not solely to blame, drought and unemployment are believed to have contributed to the unrest that led to Syria's civil war and generated one of the largest refugee crises in recent memory.

Climate change is also impacting migration closer to home. Climate change factors were an underlying issue during the Central American border surge in the early 2010s. Prior to the migrant caravans, farmers in Central America had been economically devastated by the spread of the coffee rust fungus.[224] This fungus affected 70 percent of the coffee crop in Guatemala and cost the country 100,000 jobs.[225] Likewise, in El Salvador, nearly 75 percent of all coffee trees were infected.[226] Climate change has also contributed to migration movements in Mexico. In examining correlations between climate change, crop yields, and cross-border migration between Mexico and the United States, Feng, Krueger, and Oppenheimer have discovered that a "10% reduction in crop yields would lead an additional 2% of the population to emigrate."[227] With temperatures rising and climate change already affecting migration movements worldwide, U.S. immigration authorities can expect these conditions to trigger future mass migration.[228] Therefore, it is important for U.S. immigration authorities to stay mindful of ecological stressors and the effects of climate change when examining whether an originating country is vulnerable to a mass-migration exodus.

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222 Francesco Femia and Caitlin Werrell, "Syria: Climate Change, Drought and Social Unrest," Center for Climate and Security, February 29, 2012, https://climateandsecurity.org/2012/02/syria-climate-change-drought-and-social-unrest/.

223 Femia and Werrell.

224 Carrie Kahn, "Rust Devastates Guatemala's Prime Coffee Crop and Its Farmers," NPR, July 28, 2014, https://www.npr.org/sections/thesalt/2014/07/28/335293974/rust-devastates-guatemalas-prime-coffee-crop-and-its-farmers.

225 Gootnick, *Central America*, 4–5.

226 Kahn, "Rust Devastates Guatemala's Prime Coffee Crop."

227 Feng, Krueger, and Oppenheimer, "Climate Change, Crop Yields and Mexico–US Cross-Border Migration," 1.

228 Lustgarten, "Where Will Everyone Go?"

In conclusion, this section has revealed several key findings that could assist the U.S. government in determining which countries are at risk of mass migration. Mass migrations are more likely to come from a country with an underperforming economy. They are also more likely to come from countries that rate poorly on the corruption perception index, which reflects the crime and corruption a populace is experiencing. Furthermore, mass migrations are more likely to come from countries involved in conflict. Finally, climate change should be expected to exacerbate migration stressors. However, just because a country has low gross domestic product, high conflict, or crop failure does not necessarily mean it will experience a mass migration, let alone a mass migration to the United States. While it is important to analyze factors pushing migrants out of their home countries, it is also important to examine factors pulling migrants toward the United States.

C. PULL FACTORS

In the literature surrounding international migrations, researchers have pinpointed several key factors that pull migrants toward a location. Migrants move to countries with better economies and less corruption and crime than their countries of origin, and where they have family or cultural connections.[229]

In 2013, during the height of the mass migration of children from Central America, the United Nations High Commissioner for Refugees (UNHCR), alarmed by the increasing number of children seeking asylum in the United States, conducted a study on the phenomenon.[230] Its purpose was to ascertain the sudden reasons behind this mass exodus and determine whether these reasons rendered the migrant children a protected class. In interviewing hundreds of migrant children crossing the border, the UNHCR found similarities in the reasons the children decided to immigrate to the United States.[231] The pull factors identified by the UNHCR correlated closely with those from historical mass migrations, as well as Maslow's hierarchy of needs. The children's main pull factors

[229] Johnson, "Using Maslow's Hierarchy of Needs."

[230] United Nations High Commissioner for Refugees, *Children on the Run: Unaccompanied Children Leaving Central America and Mexico and the Need for International Protection* (Washington, DC: United Nations High Commissioner for Refugees, 2014), https://www.unhcr.org/en-us/children-on-the-run.html.

[231] United Nations High Commissioner for Refugees, 24.

included deprivation, economic opportunity, escape from violence in their home countries, family reunification, and educational opportunities.[232] While family unit migrations are studied less frequently than child migrations, the factors listed in the UNHCR's report are consistent with what this author has seen working face-to-face with family unit migrants for over a decade.

1. Deprivation

Interestingly, the UNHCR lists deprivation in their originating countries as one of five predominant reasons migrant children leave home. According to the UNHCR's *Children on the Run* report, more than half of all children studied discussed "issues related to poverty and lacking basic survival necessities."[233] The report defines deprivation as a lack of access to adequate food, shelter, healthcare, and education, which closely align with Maslow's physiological needs.[234]

2. Economic Opportunity

According to the UNHCR's report, 51 percent of the migrant children cited economic opportunity as a reason to come to the United States.[235] However, very few children listed this factor as the sole reason for coming to the United States.

3. Crime and Violence

During UNHCR interviews, violence in the community, fear of local gangs, and the country's inability to protect children from such violence were underlying themes.[236] An interview with a 17-year-old migrant boy from Honduras illustrates this threat of violence: "My grandmother wanted me to leave. She told me: 'If you don't join, the gang will shoot you. If you do join, the rival gang will shoot you—or the cops will shoot you. But if you

232 United Nations High Commissioner for Refugees.

233 United Nations High Commissioner for Refugees, 46.

234 United Nations High Commissioner for Refugees, 46.

235 United Nations High Commissioner for Refugees, 24.

236 United Nations High Commissioner for Refugees, 24.

leave, no one will shoot you.'"[237] According to the UNHCR, "48% of the children interviewed shared that they had experienced or been threatened with serious harm by organized armed criminal actors…state actors, or other actors within the community or that they had suffered such harm due to a lack of sufficient protection by the state."[238] These children's experiences demonstrate a clear security issue under Maslow's hierarchy of needs.

4. Desire for Family Reunification

A desire for family and social connections is one of the biggest pull factors for international migration. In the immigration field, the term used to describe this phenomenon is diaspora, defined as the dispersion of any group of people beyond their homeland.[239]

The locations of these diasporic communities can influence a migrant's choice of whether and when to migrate. Belief systems that migrants have regarding the United States are shaped by their social connections and are an underlying factor in migration decisions.[240] The presence of previous migrants from an originating country has a substantial impact on the number of future migrants from that country to choose a destination.[241] Clark et al. have found that the presence of such diasporic communities draws on average six more immigrants annually per thousand than do locations without such communities.[242] While researchers recognize that part of this increase can be

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[237] United Nations High Commissioner for Refugees, 36.

[238] United Nations High Commissioner for Refugees, 26.

[239] *Oxford English Dictionary*, s.v. "diaspora," accessed May 15, 2021, https://www.oed.com/view/Entry/52085.

[240] Al-Khulaidy and Swartz, "Along the Border," 3.

[241] Ximena Clark, Timothy J. Hatton, and Jeffrey G. Williamson, "Explaining U.S. Immigration, 1971–1998," *Review of Economics and Statistics* 89, no. 2 (May 2007): 368, https://doi.org/10.1162/rest.89.2.359.

[242] Clark, Hatton, and Williamson, 368.

explained by immigration policies that favor family reunification, they note that the friends-and-relatives effect held true even in the absence of such policies.[243]

Family reunification was also a significant pull factor in the mass migrations of Central American children and family units.[244] UNHCR survey data indicate that a sizeable number of the Central American children already had a parent in the United States.[245] Furthermore, the Government Accountability Office has suggested that economic conditions in the United States, which had improved considerably in the 2010s, enabled parents already in the country to affordably send for the family members they had left in Central America.[246] These findings closely align with Maslow's love and belonging needs.

By understanding the size and locations of diasporic communities in the United States, the U.S. government can better predict which countries' migrants are likely to come to the United States and where they might reside. For example, as of 2018, Mexicans account for 51 percent of unauthorized non-citizens in the United States, Mexico being by far the most common country of origin for non-citizens in the United States.[247] However, 56 percent of those non-citizens reside in just two states—California and Texas.[248] Similar patterns hold true for other regions in the world. As of 2018, 84 percent of African migrants in the United States originated in sub-Saharan Africa.[249] Of those migrants, the majority

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243 Emma Israel and Jeanne Batalova, "Mexican Immigrants in the United States," Migration Policy Institute, November 5, 2020, https://www.migrationpolicy.org/article/mexican-immigrants-united-states-2019; Timothy J. Hatton and Jeffrey G. Williamson, *The Age of Mass Migration: Causes and Economic Impact* (Oxford: Oxford University Press, 1998).

244 Gootnick, *Central America*.

245 Kandel, *Unaccompanied Alien Children: An Overview*, 15; United Nations High Commissioner for Refugees, *Children on the Run*, 34.

246 Gootnick, *Central America*; William A. Kandel et al., *Unaccompanied Alien Children: Potential Factors Contributing to Recent Immigration*, CRS Report No. R43628 (Washington, DC: Congressional Research Service, 2014), 13, https://crsreports.congress.gov/product/pdf/R/R43628.

247 Israel and Batalova, "Mexican Immigrants in the United States."

248 Israel and Batalova.

249 Carlos Echeverria-Estrada and Jeanne Batalova, "Sub-Saharan African Immigrants in the United States," Migration Policy Institute, November 6, 2019, https://www.migrationpolicy.org/article/sub-saharan-african-immigrants-united-states-2018.

originated in just five countries—Nigeria, Ethiopia, Ghana, Kenya, and Somalia.[250] By knowing which diasporic communities exist in the United States and where they reside, the U.S. government can gauge which countries' migrants are more likely to migrate to the United States when triggering events occur.

5. Educational Concerns

Both the UNHCR and Government Accountability Office have listed educational opportunities as a pull factor for Central American migrant children. According to the UNHCR, "At the very core of what could be called root causes for children leaving these four countries and coming to the U.S. are issues of entrenched poverty and deep lack of meaningful opportunity for education and employment."[251] In essence, economic and educational opportunities in the United States were important pull factors in the mass migrations of the 2010s. Notably, educational desires correlate closely with Maslow's self-actualization tier.

Thus far, reasons behind the mass migrations from Central America correlate closely with historical migrations. For example, belongingness and love needs have weighed heavily on the minds of migrants throughout history, as many people have migrated to reunite with family members and maintain familial, cultural, and linguistic connections.[252] This is why migrations continue long after the threats that started the mass migrations have passed. For example, while the Irish potato famine took place in the 1840s and ebbed by the early 1850s, Irish immigrants continued mass migrations to the United States through the 1850s and beyond to join loved ones in America.[253]

In order to measure this factor, data could be gathered from CIS and CBP to see which countries have large numbers of persons living in the United States, thus helping the U.S. government predict numbers of migrants likely to join a diaspora in the United States. This information is useful for migration foresight: if the United States has seen many

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[250] Echeverria-Estrada and Batalova.

[251] United Nations High Commissioner for Refugees, *Children on the Run*, 24.

[252] Dysart, "Remote Sensing and Mass Migration Policy Development," 2.

[253] Johnson, "Using Maslow's Hierarchy of Needs."

migrants coming from an originating country in the recent past, it should expect more migrants to join those already here. However, examining push and pull factors alone are not enough to accurately predict the source of the next mass migration.

D. PATH FACTORS

While many countries experience typical push-pull factors, not all countries experience a mass-migration exodus. To determine which countries are more likely to migrate, one must examine how migrants travel from their home country to their destination country. The means of travel, referred to as the path factor, remains a significant variable in mass migrations. A path's capacity and ease of travel are the biggest indicators of whether a path will allow a mass migration.[254]

It stands to reason that capacity, sometimes referred to as flow rate, is an important factor in the path a mass migration might take.[255] While speed boats can traverse the Caribbean quickly and at times evade Coast Guard cutters, they can only hold a small number of people, thus limiting the flow of migrants. Alternatively, land travel where there are multiple routes, methods of transportation, and entry and exit points—such as paths throughout Central America—has a much higher capacity or flow rate. Johnson puts it best when he says "a path that is easy to enter, transit and exit will have a high flow rate. However, even a path that is difficult to enter or exit may have a high flow rate if there are numerous points of entry or exit."[256]

Ease of travel naturally plays a significant role in accommodating a mass migration.[257] Understandably, the easier the path, the more people who can make the journey. Conditions that are difficult to traverse—such as requiring mountainous hikes or long journeys on foot—will preclude elderly, impaired, or physically unfit people from making the journey. If the journey is costly such that it requires significant travel expenses like flights or the use of a smuggler, then people unable to afford to pay will not complete

254 Johnson, 7.

255 Johnson, 7.

256 Clark, *Early Warning of Refugee Flows*.

257 Lee, "A Theory of Migration," 51.

the journey. All these factors limit the number of people that can make the journey, thus acting as a bottleneck to prevent a migration from reaching massive numbers.

However, other path factors are at work, too. Historically, U.S. immigration authorities' ability to process vast numbers of non-citizens was a factor that drew migrants to the United States.[258] It could also be argued that in the distant past, the shipping industry was a significant factor in migration to the United States as it allowed persons to cross the ocean in great numbers.[259] Later, the proximity of Caribbean islands and their boats at the ready fostered a path. However, due to greater maritime enforcement and the ability to process Caribbean migrants outside the United States, that path is largely closed to mass migrations.[260] A perfect example is the Haitian mass migration of 2016. Typically, Haitians had entered the United States via boats, but lenient visa policies in countries like Brazil and Venezuela allowed a path for Haitians to enter South America legally, thus opening a new path to the United States.[261] While some Haitians stayed to work, others decided to make the journey north to the United States in the first mass Haitian migration from the southwest border.[262]

Social connections also shape migrants' decisions about the path to take when migrating.[263] Hatton and Williamson argue that earlier migrants reduce the risk and decrease the costs for future migrants, thus increasing movement along specific paths.[264] Moreover, migrants gather information from social connections in the United States to

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258 Johnson, "Using Maslow's Hierarchy of Needs."

259 Johnson.

260 R. B. Watts, "Preparing for the Next Mass Migration: Lessons from the Past and Recommendations for the Future," *Homeland Security Affairs*, UAPI Summit Special Issue (October 2017): 2, https://www.hsaj.org/articles/14133.

261 Mark Chong, "Brazil Cuts Back on Burdensome Visa Restrictions," *International Expansion* (blog), December 20, 2017, https://ieglobal.vistra.com/blog/2017/12/brazil-cuts-back-burdensome-visa-restrictions#; Kyllah Terry, "New Haitian Migration Patterns End in Displacement," UCLA Latin American Institute, April 17, 2019, https://www.international.ucla.edu/lai/article/202365.

262 Terry, "New Haitian Migration Patterns End in Displacement."

263 Massey and Zenteno, "The Dynamics of Mass Migration," 5328.

264 Hatton and Williamson, *The Age of Mass Migration*.

determine the best path to take before traveling.[265] Al-Khulaidy and Swartz's research demonstrates that social connections help shape a Central American migrant's decision of which entry point along the southwest border to choose.[266] This pattern is especially prevalent following policy changes affecting migration, such as the decision to close a border. Figure 10 illustrates the most common migration routes through Central America to the United States.

Figure 10. Central American Migration Routes to the United States[267]

When examining paths a mass migration could take, immigration authorities should ask themselves a multitude of questions to determine the viability of the paths and the

[265] Frouws et al., *Getting to Europe the Whatsapp Way*.

[266] Al-Khulaidy and Swartz, "Along the Border."

[267] Source: Hodgson, "World Economic Forum."

number of migrants they can accommodate. How far must migrants travel? How much does it cost? How difficult is the journey? Will their country let them leave? The answers can help guide predictions of the number of migrants that could use such a path. It stands to reason that given strong push-pull factors, the easier the path, the more likely the migration. As most migrants immigrate to countries proximate to their home countries, it should come as no surprise that Mexico, Honduras, Guatemala, El Salvador, and Haiti have been the starting point for many recent mass migrations to the United States.[268]

For some migrants traveling from overseas, the economic opportunity in the United States provides a strong enough pull to overcome the proximity barrier. Furthermore, lenient visa policies and lax immigration vetting in South American countries like Brazil could be relevant path factors to the United States for migrants traveling from overseas.[269] Though there are exceptions to every rule, it stands to reason that the biggest mass-migration threats faced by the United States today are from the Northern Triangle and the Caribbean.

One needs only look at path factors for Central America to understand why mass migrations to the United States are so prevalent from that region. Central American countries are the closest to the United States, and the path can maintain a high flow rate, as was seen during the multiple mass migrations of the 2010s. The path from Central America to the United States also has multiple routes, ease of travel, and well-organized alien smugglers to help facilitate the journey. This combination of favorable factors has made mass migrations from Central America so prevalent in the recent past.

For Central American children and family units, well-organized alien smugglers seem to be a key factor. One notable path factor for mass migrations across the decades and countries of origin is knowing others who have already made the journey.[270] For example, before the mass migration of children from Central America, the United States

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[268] Johnson, "Using Maslow's Hierarchy of Needs," 47.

[269] Terry, "New Haitian Migration Patterns End in Displacement"; House Homeland Security Committee, *Stopping Terrorist Travel*.

[270] Clark, *Early Warning of Refugee Flows*, 14.

faced a similar, though less extensive, migration from Mexico before 2012.[271] Therefore, smuggling routes had already been established throughout the Mexican leg of the journey.

In addition, the United States already has a significant Central American population. As of 2019, it was estimated that 3.5 million Central Americans were already living in the United States.[272] This existing network makes it likely that potential Central American migrants already know someone who has made the journey and can provide them with guidance on the best path to take or the best smugglers to hire.

1. Triggering Events

According to Lance Clark, "Triggering events are those final critical occurrences that may convince significant numbers of people to leave their country."[273] Triggering events can be generated by an escalation in push factors or an opening of the path.[274] For example, the Mariel boatlift event was triggered by Castro's opening the port to allow people to leave.[275] Another example is the 2016 Olympics in Rio de Janeiro, Brazil, whereby the United States experienced increased arrivals from non-citizens from uncommon countries due to the ease of obtaining visas for the Olympic games. In most situations, a triggering event is preceded by a gradual escalation of push factors in the originating country. The situation may intensify, affect more people, or spread to new areas.[276] Immigration authorities could investigate the number of people affected by such triggering events and the numbers who could flee to hone their projections.

Triggering events can also be large-scale incidents like natural disasters. Again, Haiti is a perfect example. In 2015, Hurricane Matthew hit Haiti and triggered a mass

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[271] Senate Committee on Appropriations, *Review of the President's Emergency Supplemental Request* (Washington, DC: Senate, 2014), 21, https://www.hsdl.org/?view&did=756261.

[272] Allison O'Connor, Jeanne Batalova, and Jessica Bolter, "Central American Immigrants in the United States in 2017," Migration Policy Institute, August 15, 2019, https://www.migrationpolicy.org/article/central-american-immigrants-united-states.

[273] Clark, *Early Warning of Refugee Flows*, 17.

[274] Clark, 12.

[275] Gootnick, *Central America*.

[276] Clark, *Early Warning of Refugee Flows*.

migration of Haitians to the United States the following year.[277] Haiti had been experiencing a gradual escalation of push factors, but mass migration to the United States did not start until after the hurricane took place.

Compounding triggering events led to surges in children and family units at the U.S. border during the 2010s. First, aggressive public relations campaigns overexaggerated the ease of entry to the United States.[278] During this time, many migrants mentioned the availability of permisos when asked about why they had chosen to enter the United States.[279] They were likely referring to Deferred Action for Childhood Arrivals (DACA) and Jeh Johnson's immigration enforcement priorities of 2014.[280] Unfortunately, they did not realize that as new entrants, they were still a priority for deportation under these enforcement priorities.[281] Likewise, for migrant children, they failed to realize that, having entered the United States after DACA went into effect in 2012, they did not qualify for the program. However, in keeping with Johnson's findings, the migrants' perception of their reception weighed more heavily in their decision-making than did the reality of the situation.

Other triggering events can relate to perceptions about the future viability of the path.[282] For example, at the end of the Obama administration, after Donald Trump won the election, the United States experienced another wave of Central American migrants, who thought they could enter before Trump's border wall could be built.

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277 Terry, "New Haitian Migration Patterns End in Displacement."

278 Johnson, "Using Maslow's Hierarchy of Needs"; Gootnick, *Central America*.

279 Gambler, *Southwest Border*.

280 Kandel et al., *Unaccompanied Alien Children: Potential Factors*.

281 Jeh Johnson, "Policies for the Apprehension, Detention, and Removal of Undocumented Immigrants" (official memorandum, Washington, DC: Department of Homeland Security, 2014), https://www.dhs.gov/sites/default/files/publications/14_1120_memo_prosecutorial_discretion.pdf.

282 Clark, *Early Warning of Refugee Flows*, 17.

2. Seasonality

Seasonal factors and weather also influence migration flows.[283] Typically, the number of migrants arriving at the southwest border increases between February and June when temperatures in the desert are more temperate.[284] The Mexican Migration Project conducts its annual surveys in Mexico in the winter, when migrants are likely to be back in their originating countries.[285] As poor weather restricts migration movements, especially extreme heat in the desert areas of the southwest border, weather variables could prove useful for the U.S. government in anticipating migration flows.

3. Coping Strategies

However, not all countries that have significant push-path-pull factors end up producing migrants, let alone ones to the United States. Likewise, most migration flows do not evolve into mass migrations.[286] Therefore, a look at coping strategies in countries helps to narrow the list of areas most likely to generate mass migrations.

Typically, migration is not the first option when living in one's home country becomes challenging. People often exhaust a pattern of strategies before resorting to international migration.[287] Once sufficient push-pull factors are in place to generate a mass migration, examining coping strategies and knowing how many people from the at-risk country are in each stage can help the United States increase the precision with which it anticipates mass migrations.

For example, before choosing international flight, many migrants first move within their own country. These people are called internally displaced migrants. Typically, in-

283 Ahmed et al., "Data-Driven Mass Migration Analysis," 4.

284 Nicole Narea, "9 Questions about the Humanitarian Crisis on the Border, Answered," Vox, March 27, 2021, https://www.vox.com/policy-and-politics/22346509/humanitarian-border-crisis-biden-unaccompanied-children.

285 Scott Rodilitz and Edward H. Kaplan, "Snapshot Models of Undocumented Immigration," *Risk Analysis* (2020): 4, https://doi.org/10.1111/risa.13658.

286 Johnson, "Using Maslow's Hierarchy of Needs."

287 Clark, *Early Warning of Refugee Flows*, 10.

country migration resembles rural migrants' retreating to cities to make money.[288] This phenomenon was portrayed in John Steinbeck's famous novel *The Grapes of Wrath*, in which tenement farmers migrate from their rural town in search of work. They first try informal refuges such as staying with family, but if they exhaust that coping strategy, they often move to more formal safe havens such as refugee or relief camps.[289] If the situation dissipates, most will return home; if it does not, international migration is often seen as a last resort. For many migrants, their destination will be a place close to home, but if that does not work, some will eventually make the journey to the United States.

The number of internally displaced migrants in each country is monitored by the Internal Displacement Monitoring Centre, which publishes information online.[290] As of 2018, the number of people internally displaced by violence and conflict reached 41.3 million, the highest number on record.[291] Information from the Internal Displacement Monitoring Centre often closely correlates with migration numbers. For example, in 2019, it registered 455,900 internally displaced migrants in El Salvador.[292] That same year, the number of Salvadorans apprehended at the southwest border of the United States rose by 50,000 over the previous year.[293] U.S. immigration authorities could examine these trends and note any patterns that may assist in migration foresight planning. By examining data on previous migration flows affecting the United States, patterns can be recognized and used to help anticipate future migration flows.[294] Figure 11 is a graphic representation of the push-path-pull factors identified in this chapter.

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288 Dysart, "Remote Sensing and Mass Migration Policy Development," 3.

289 Clark, *Early Warning of Refugee Flows*, 11.

290 "Displacement Data," Internal Displacement Monitoring Centre, accessed April 18, 2021, https://www.internal-displacement.org/home.

291 International Organization on Migration, *World Migration Report 2020* (Geneva: International Organization on Migration, 2020), 3, https://publications.iom.int/system/files/pdf/wmr_2020.pdf.

292 Internal Displacement Monitoring Centre, "Displacement Data."

293 Customs and Border Protection, "Nationwide Apprehensions by Citizenship and Sector."

294 Ahmed et al., "Data-Driven Mass Migration Analysis," 2.

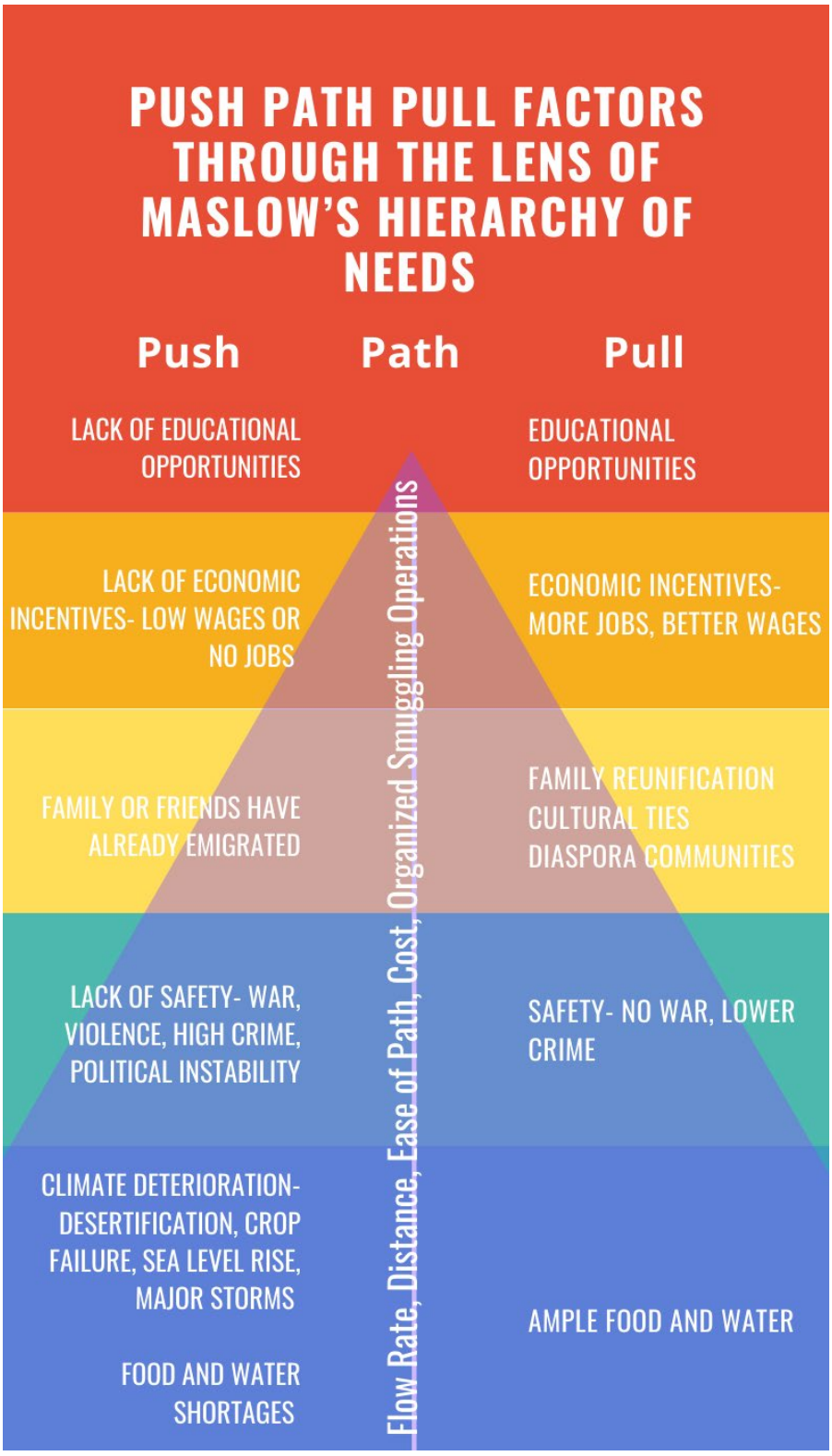

Figure 11. Push-Path-Pull Factors through the Lens of Maslow's Hierarchy of Needs

E. CONCLUSION

This chapter set out to overcome the challenges to strategic forecasting of mass-migration flows. As mentioned at the beginning of this chapter, the first two challenges are issue complexity and data availability. While the reasons people migrate are as varied as the migrants themselves, by examining such reasons through unmet needs in the populace of originating countries, using Maslow's hierarchy of needs as a framework, this thesis has begun to reduce the complexity of the migration forecasting process. This chapter also offered ways to quantify the different push and pull factors and presented data sources for doing so, thus beginning the process of overcoming the data availability challenge to strategic forecasting. By understanding the factors at play in the migrant's decision-making process, and how to quantify such factors, the U.S. government could begin homing in on data points for anticipating mass-migration events and building the capacity to do so.

However, an analysis of push, pull, and path factors alone is insufficient to predict mass-migration events.[295] Decision-makers need more precise information about when, where, and how many people are coming to effectively guide their decisions.[296] They will need to leverage technology and modeling to hone the accuracy of such metrics.

[295] Diana Suleimenova, David Bell, and Derek Groen, "A Generalized Simulation Development Approach for Predicting Refugee Destinations," *Scientific Reports* 7 (2017): 1–13, https://doi.org/10.1038/s41598-017-13828-9.

[296] Shellman and Stewart, "Factors Associated with Forced Migration," 174.

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III. TECHNOLOGIES AND MODELING FOR ANTICIPATING MASS-MIGRATION FLOWS

U.S. immigration authorities currently use the Biometric Identification Transnational Migration Alert Program (BITMAP) on a small scale to receive advance notice of migrants approaching the southwest border.[297] This program involves creating biometric data-sharing agreements between the United States and partner nations, collecting fingerprints from international migrants transiting the countries, and running the fingerprints through U.S. immigration databases.[298] These actions trigger automatic notifications to U.S. immigration authorities that these migrants are en route to the United States. Immigration officials credit BITMAP with identifying hundreds of known or suspected terrorists over the course of several years, but the program does not go far enough.[299]

For one, the program does not capture information on all migrants. Most countries participating in BITMAP capture biometrics only from migrants suspected of being at high risk of terrorism or part of a transnational criminal organization. Thus, it does not accurately represent the volume of migrants en route to the United States. Also, BITMAP does not typically result in migrants' being turned back to their originating countries. Instead, biometric information is captured, and the migrants continue their journey north to the United States. Therefore, while it serves a valuable purpose in that it lets U.S. immigration authorities know when high-risk non-citizens are en route to the United States, it does not go far enough in determining when, from where, and how many migrants are coming.

BITMAP is also costly to operate. The U.S. government spends approximately $20 million per year operating this program.[300] Given that homeland security officials credit

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[297] Biometric Identification Transnational Migration Alert Program Authorization Act of 2018, H. Res. 6439, 116th Cong. (2018), https://www.congress.gov/bill/115th-congress/house-bill/6439/text.

[298] Biometric Identification Transnational Migration Alert Program Authorization Act of 2018.

[299] House Homeland Security Committee, *Stopping Terrorist Travel*, 16.

[300] House Homeland Security Committee, 22.

the program only with identifying several hundred known or suspected terrorists in a few years, BITMAP does not appear to yield a good return on investment. Furthermore, the program is labor intensive and time consuming. The U.S. government must provide partner nations with the biometric devices and train foreign government officials on how to use them. This is a significant time and financial allotment for such a limited result. Therefore, this chapter posits there are less expensive, more effective ways to anticipate mass-migration flows and explores emerging technologies that might be utilized to help improve the accuracy of migration forecasts.

A. EMERGING TECHNOLOGIES

Several existing and emerging technologies could be explored to advance the accuracy of migration forecasting tools. These technologies include internet search analysis, satellite imagery, and cell-phone tower data. This section explores how these technologies could be used to improve mass-migration forecasting.

1. Satellite Imagery

Among the most promising technologies, open-source satellite imagery could be used to better predict mass migrations. Notably, data from satellite imagery can identify and predict worldwide threats to human survival that might trigger mass migration.[301] Scientists can to use satellites to detect water scarcity, disease, and crop failure, and in some cases, such satellite imagery analysis has proven more accurate than in-person analysis.[302] Water scarcity, disease, and crop failure have the potential to stimulate mass migrations as people flee their homes as a matter of survival.[303] Analyzing the strain on food or water supplies could help U.S. immigration authorities determine where the next mass migration is likely to come originate.

Satellite technology could prove a valuable tool for anticipating mass migration given its ability to predict migration stressors before they reach breaking points. This could

[301] Dysart, "Remote Sensing and Mass Migration Policy Development," 9.

[302] Dysart.

[303] Dysart, 10.

help point analysts in the right direction for targeted mass-migration forecasting and direct decision-makers toward areas in need of humanitarian relief. Scientists have been able to predict crop yields months before the harvest is scheduled using remote-sensing capabilities combined with machine learning.[304] For example, if the U.S. government knows three months before the harvest that Guatemala's crop yield is going to be lower than needed to sustain the populace, researchers could start looking more closely for other data metrics signaling the beginning of a mass migration. With advance notice, instead of waiting for a mass migration to start, the U.S. government could detect these resource strains and work with partner organizations, such as the U.S. Agency for International Development, or non-governmental organizations to provide aid to help alleviate the migration stressors. For example, if crops are failing in Guatemala, the United States could send food aid to help prevent famine, potentially alleviating the need for the mass migration.[305]

However, satellite technology also has its weaknesses. First, not all countries that manifest stressors experience mass migrations.[306] Therefore, this metric alone is not sufficient to predict mass migrations. Second, this technology requires intensive data analysis, so people will need to review these satellite images regularly. Third, the inherent privacy concerns would need to be carefully considered when adopting the use of satellite imagery. Nevertheless, some of these limitations could be overcome, particularly regarding data analysis. Other government agencies or organizations, such as the U.S. Geological Survey, the U.S. Department of Agriculture, and the National Reconnaissance Office, are already analyzing satellite imagery.[307] The potential exists for U.S. immigration authorities to partner with these organizations so as not to duplicate efforts. In addition,

304 Jiaxuan You et al., "Combining Remote Sensing Data and Machine Learning to Predict Crop Yield," Sustainability and Artificial Intelligence Lab, accessed April 17, 2021, http://sustain.stanford.edu/crop-yield-analysis.

305 Dysart, "Remote Sensing and Mass Migration Policy Development."

306 Johnson, "Using Maslow's Hierarchy of Needs."

307 Fort Collins Science Center, "Agriculture from 'Landsat Imagery: A Unique Resource,'" U.S. Geological Survey, accessed October 23, 2020, https://www.usgs.gov/centers/fort/science/agriculture-landsat-imagery-a-unique-resource?qt-science_center_objects=0#qt-science_center_objects; Dysart, "Remote Sensing and Mass Migration Policy Development."

privacy concerns could be mitigated by using satellite imagery solely to monitor migration stressors like crop health and water strain instead of migrant movements. Given that these are not new satellite images and the intent is to use existing ones, such concerns are a surmountable risk.

Satellite imagery could be a valuable tool for anticipating mass migrations. It has the potential to help U.S. immigration authorities foresee and even alleviate mass-migration flows before they occur. Scientists can use satellites to detect migration stressors such as water scarcity, disease, and crop failure before they reach their breaking point.[308] This technology could deliver the advance warning that U.S. immigration authorities need to prepare for a mass-migration event.

2. Internet Search Analysis

Internet search analysis is a promising new technology for detecting mass migration. This technology involves analyzing the number of people who are searching for key terms on search engines like Google. Seth Stephens-Davidowitz in his best-selling book on the topic, *Everybody Lies*, maintains that internet queries are a more reliable source than traditional surveys in understanding people's desires and motivations because people search the internet for things they would never ask another person.[309] Therefore, internet search analysis could prove a powerful source of information for migration forecasting.

Additionally, researchers such as Lin and Böhme have identified search terms associated with domestic and international migration and successfully forecasted such migration using internet search analysis.[310] Böhme, Gröger, and Stöhr's research demonstrates that international migrants research possible routes before making the journey north to the United States.[311] Therefore, conducting internet search history

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308 Dysart, "Remote Sensing and Mass Migration Policy Development."

309 Seth Stephens-Davidowitz, *Everybody Lies* (London: Bloomsbury Publishing, 2017).

310 Allen Yilun Lin, Justin Cranshaw, and Scott Counts, "Forecasting U.S. Domestic Migration Using Internet Search Queries," in *Proceedings of the World Wide Web Conference* (New York: Association for Computing Machinery, 2019), 1061–72, https://doi.org/10.1145/3308558.3313667; Böhme, Gröger, and Stöhr, "Searching for a Better Life."

311 Böhme, Gröger, and Stöhr, "Searching for a Better Life."

analysis at the meta-level may successfully predict both domestic and international migration with more accuracy than leading migration metrics.[312] It also proves useful ahead of the actual moves, sometimes one to two years in advance, meaning that a government could plan for and allocate resources for the impending migration.[313] This technology has some significant advantages for mass-migration planning in that it could help U.S. immigration authorities estimate the number of migrants making the journey north and provide indications that local stressors have reached the point a mass migration is possible.

Internet search technology has the potential to improve the accuracy of migration flow predictions. First, Google has more than one billion users worldwide, making it a rich resource for capturing data.[314] Second, Google makes its search data available via Google Trends and Google Ads, allowing users to see what keyword searches are trending and approximately how many people are searching for them. This information can be further separated by country of origin, so U.S. immigration authorities may see which countries—and which areas within those countries—are searching for key terms that might signal international migration.[315] As Google already has such data neatly packaged, there is no need for heavy data analysis or the need to obtain permissions. Also, internet search analysis has the potential to serve as a leading indicator of mass migration.[316] Migrants are increasingly using internet searches to find their destination and routes in advance.[317] Therefore, by monitoring migration-related keyword trends in originating countries, the U.S. government could estimate the number of potential migrants coming to the United States in the next year.

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312 Lin, Cranshaw, and Counts, "Forecasting U.S. Domestic Migration"; Böhme, Gröger, and Stöhr, "Searching for a Better Life."

313 Lin, Cranshaw, and Counts, "Forecasting U.S. Domestic Migration"; Böhme, Gröger, and Stöhr, "Searching for a Better Life."

314 Böhme, Gröger, and Stöhr, "Searching for a Better Life."

315 "Home Page," Google Trends, accessed October 23, 2020, https://trends.google.com/trends/?geo=US.

316 Böhme, Gröger, and Stöhr, "Searching for a Better Life."

317 Böhme, Gröger, and Stöhr.

However, this technology is not without its weaknesses. Just because people search for international migration–related terms does not mean they will depart for the United States. Also, because the data do not predict when migrants are likely to come to the United States, this technology would need to be paired with other technologies or forms of analysis to improve accuracy. But getting indications of a mass migration with some lead time is not the only thing required for anticipating mass-migration flows. U.S. immigration authorities also need accurate information about when and where migrants will arrive and how many migrants are coming. For this, cell-phone tower tracking shows promise.

3. Cell-Phone Tower Tracking

Cell-phone tower data have the potential to be a powerful source of information on migration movements. Obtaining such data involves looking at the number of cellular phones pinging a particular cell tower. For the purposes of this thesis, the analysis involves cell-phone tower usage, not individual cell-phone tracking. As cell-phone usage is increasing worldwide, most international migrants carry smart phones on their journey.[318] Using de-identified data on cell-phone locations, researchers have shown population movements in real time and estimated the total number of displaced persons with a high degree of accuracy.[319] For example, if a cell-phone tower typically has 3,000 cell phones utilizing it but then jumps to 10,000 within a short period, it could indicate a large number of people moving through the area.

Following cell-phone tower data could help U.S. immigration authorities estimate how many migrants have been displaced and in which direction they are moving. This information may provide an indication of whether and how quickly displaced migrants will arrive at the southwest border. While it would not be practical to monitor cell-phone data around the world, this technology could prove valuable in tracking displaced migrants following a natural disaster or other event that might lead large numbers of people to

[318] Linda Raftree, Katie Appel, and Anika Ganness, *Modern Mobility: The Role of ICTS in Child and Youth Migration* (Washington, DC: Plan International USA, 2013), 16, https://resourcecentre.savethechildren.net/node/7893/pdf/modern_mobility.pdf; Frouws et al., *Getting to Europe the Whatsapp Way*.

[319] Bengtsson et al., "Improved Response to Disasters and Outbreaks."

migrate—without needing people on the ground to observe them.[320] Thus, leveraging this technology could assist humanitarian and border patrol agencies in directing appropriate resources and personnel to the right location in a timely manner.[321]

However, U.S. immigration authorities should carefully consider the weaknesses of this technology. First, it does not serve as a leading indicator of mass migration. Second, it does not capture all populations, including children or elderly people who are less likely to carry cell phones.[322] Third, people may raise concerns over privacy or sue the government over its use of this technology. Fourth, the companies or government entities that own the cell-phone towers might refuse to give the U.S. government access to the data. Fifth, cell-phone towers can become non-operational following a natural disaster. Sixth, cell-phone tower data can at times be misleading, as sporting events, protests, and concerts also produce similar data to mass migrations. Finally, some have voiced concern that this information could be used for nefarious purposes. For example, cartels are known to piggyback onto cell-phone towers in Mexico and Central America, so this technology could be used by cartels to exploit migrants en route to the United States.[323] Nevertheless, this information could prove valuable in tracking displaced migrants in real time and determining where and when they will arrive at the southwest border. Therefore, this technology warrants further examination by U.S. immigration authorities.

4. Summary

This thesis recommends the complementary use of all three technologies—satellite imagery, internet search analysis, and cell-phone tower tracking—to improve the accuracy of migration forecasting. Satellite imagery could be used to predict in advance countries

320 Bengtsson et al.

321 Bengtsson et al., "Improved Response to Disasters and Outbreaks"; Joshua E. Blumenstock, "Inferring Patterns of Internal Migration from Mobile Phone Call Records: Evidence from Rwanda," *Information Technology for Development* 18, no. 2 (2012): 107–25, https://doi.org/10.1080/02681102.2011.643209.

322 Bengtsson et al., "Improved Response to Disasters and Outbreaks."

323 Julia Love, "Special Report: Drug Cartel 'Narco-Antennas' Make Life Dangerous for Mexico's Cell Tower Repairmen," Reuters, July 15, 2020, https://www.reuters.com/article/us-mexico-telecoms-cartels-specialreport-idUSKCN24G1DN.

experiencing migration stressors, internet queries could be used to help determine the point at which stressors push migrants toward international migration, and cell-phone tower data could be used to assess the size and direction of travel of the mass migration, thus improving migration forecast abilities.

As demonstrated above, many economic, social, and political factors influence how and when people migrate.[324] Given the number of variables involved, it is important to gather and analyze such data in a way that makes anticipating future events possible. The discussion now turns to modeling methods that may also help to anticipate future migration events.

B. CAPABILITIES AND LIMITATIONS OF MIGRATION MODELING

When attempting to model migration movements, one must determine whether people will migrate, how many migrants will move, when they will leave, and where they will go.[325] This information will help the U.S. government prepare to meet the unique needs of the migrant population by allowing for better resource allocation.[326] Therefore, this section analyzes modeling methods that can improve accuracy in each of these areas. They include agent-based modeling; probabilistic expert-based forecasting models, specifically Bayesian modeling; and Markov chain models. This section explores the efficacy of each modeling technique in anticipating migration flows, as well as the circumstances for using each method. Notably, none of these modeling methods unilaterally outshines the others, but each has value depending on the characteristics of the migration flow.

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[324] George Disney et al., *Evaluation of Existing Migration Forecasting Methods and Models* (Southhampton, UK: ESRC Centre for Population Change, University of Southampton, 2015), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/467405/Migration_Forecasting_report.pdf.

[325] Shellman and Stewart, "Factors Associated with Forced Migration," 174.

[326] Suleimenova, Bell, and Groen, "A Generalized Simulation Development Approach."

Several areas of uncertainty affect the accuracy of migration forecasting. The first relates to ambiguity surrounding the future.[327] The second relates to data discrepancies and errors.[328] For example, disparate datasets define migrants and other terms differently, causing discrepancies in the data. The final source of uncertainty relates to relying solely on one forecasting model.[329] Different migration flows, for example, labor or asylum migrations, have different characteristics and thus need to be modeled differently.[330] Likewise, forecasting models capture different data components. Therefore, relying on a single model can result in failures to capture nuances in the data. Naturally, having good sources of immigration data over a long period is helpful for increasing the accuracy of any modeling method.

1. Agent-Based Modeling

Agent-based modeling is a useful tool for anticipating migration movements by factoring in both individual decision-making processes and the relationship effect of social networks on those decisions.[331] Agent-based modeling is effective at modeling active objects, such as people, in relation to behavior, events, and time.[332] An agent-based model strives to discover the reasons behind individual decisions, and ultimately, larger structures are uncovered based on these smaller actions and interactions made at the individual level.

The "agent" of agent-based modeling reflects the individuality and independence of humans by establishing an autonomous entity within the model that makes decisions based on rules or procedures.[333] In this way, the technique can simulate the autonomous

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[327] Jakub Bijak et al., "Assessing Time Series Models for Forecasting International Migration: Lessons from the United Kingdom," *Journal of Forecasting* 38, no. 5 (2019): 471, https://doi.org/10.1002/for.2576.

[328] Bijak et al., 471.

[329] Bijak et al., 471.

[330] Bijak et al., 481.

[331] Anna Klabunde and Frans Willekens, "Decision-Making in Agent-Based Models of Migration: State of the Art and Challenges," *European Journal of Population* 32, no. 1 (February 2016): 74, https://doi.org/10.1007/s10680-015-9362-0.

[332] Suleimenova, Bell, and Groen, "A Generalized Simulation Development Approach," 2.

[333] Klabunde and Willekens, "Decision-Making in Agent-Based Models of Migration," 76.

nature of human beings, yet as with humans, other agents may influence the decisions of the autonomous entity.[334] For example, a human being is capable of making migration decisions on one's own, but the decisions of others, such as close friends or family members who have migrated in the past, may influence a person's decision whether to migrate and where to go. An agent-based models seek to replicate this independent but influenceable decision-making process utilizing the autonomous entity.

Agent-based modeling holds a distinct advantage over other modeling techniques as it is the only method that factors in the social networks that influence the decision to migrate.[335] As social networks significantly affect not only the decision to migrate but also where and how to go, encapsulating the effects of such networks is integral to a successful migration model. This modeling technique can be used to predict whether individuals will migrate, how long it will take them, and where they will go. The following paragraphs examine agent-based models and random forest methods, both of which have shown the greatest efficacy for migration purposes.

Using agent-based models, researchers have accurately predicted whether people will migrate illegally to the United States.[336] Azizi and Yektansani, for example, accurately predicted which Mexican citizens would live in the United States illegally or legally based on their characteristics before coming to the United States.[337] Using a random forest model and examining primarily demographic statistics, Azizi and Yektansani predicted illegal migration to the United States with 90 percent accuracy.[338] Agent-based models have also shown efficacy in determining when migrants will arrive at their destination. Collins and Frydenlund used an agent-based model combined with game

334 Klabunde and Willekens, 76.

335 Klabunde and Willekens, 75.

336 SeyedSoroosh Azizi and Kiana Yektansani, "Artificial Intelligence and Predicting Illegal Immigration to the USA," *International Migration* 58, no. 5 (2020): 7, https://doi.org/10.1111/imig.12695.

337 Azizi and Yektansani, 5.

338 Azizi and Yektansani, 9.

theory to show that the speed and size of migrant groups affect their arrival times.[339] While their work had limitations, they estimated that by inputting demographic information into their model, they could improve estimations of groups' arrival times.[340]

Furthermore, agent-based modeling has proven useful in predicting migrants' final destinations. Suleimenova, Bell, and Groen used agent-based simulations to correctly predict more than 75 percent of refugee destinations after the first 12 days of movement.[341] By synthesizing data from the UNHCR, the Armed Conflict Location and Event Data Project, and Bing Maps, the authors built agent-based simulations of refugee movements to determine which refugee camps the migrants would end up in.[342] They applied their model to three separate refugee crises in Africa—the 2012–2013 conflict in Northern Mali, the 2013–2016 conflict in the Central African Republic, and the 2015–2016 civil war in Burundi. This study is notable for the accuracy of their simulations in predicting migrant destinations in relatively little time. One of the benefits of their study is that the authors published their simulation code, which U.S. immigration authorities could use to help simulate migration destinations along the southwest border. In a related study, Groen used agent-based modeling to simulate refugee movements during the 2012 Mali conflict.[343] It was particularly valuable in that the author simulated how refugees would move based on different policy changes, such as countries' closing their borders.[344] Such an application would be useful to the United States in showing how migrant populations would move if certain borders or ports of entry were closed.

Huynh and Basu used an offshoot of agent-based modeling—a random forest model—to predict when internally displaced persons in Syria and Yemen would migrate

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339 A. J. Collins and E. Frydenlund, "Agent-Based Modeling and Strategic Group Formation: A Refugee Case Study," in *Proceedings of the 2016 Winter Simulation Conference* (Piscataway, NJ: IEEE, 2016), 1289–1300, https://doi.org/10.1109/WSC.2016.7822184.

340 Collins and Frydenlund.

341 Suleimenova, Bell, and Groen, "A Generalized Simulation Development Approach."

342 Suleimenova, Bell, and Groen.

343 Derek Groen, "Simulating Refugee Movements: Where Would You Go?," *Procedia Computer Science* 80 (2016): 2254, https://doi.org/10.1016/j.procs.2016.05.400.

344 Groen, 2254.

to a different region of their country.[345] Using economic and armed conflict data and distance as their variables, the researchers discovered that the random forest model predicted migration trends with 70 percent accuracy for displaced Syrians and 74 percent accuracy for displaced Yemenis.[346] There were a couple of limitations to Huynh and Basu's study, however. As with many types of modeling, the random forest model occasionally failed to capture sudden spikes in movement, and it was limited by the quality of the dataset.[347] Nevertheless, this study demonstrated the efficacy of agent-based models in forecasting and capturing migration movements.

In sum, agent-based modeling is showing promise in predicting who is likely to migrate and anticipating when and where migrants will arrive. However, this technique has its downsides. It is labor intensive and requires large datasets and long, complicated lines of code, thus making it vulnerable to bugs. This modeling type is the only one discussed here that has been proven effective in anticipating migration flows.

2. Bayesian Modeling

Another useful modeling method for anticipating migration trends is the Bayesian model. This approach easily combines different sources of information, including datasets, historical trends, and expert judgment, in a coherent way.[348] The Bayesian model has useful applications in that it allows one to factor uncertainty into the equation and does not require lengthy historical trend data for accuracy.[349] This technique has successfully predicted migration patterns using different scenarios with a promising degree of accuracy. Notably, the United Nations has adopted Bayesian modeling for long-term migration projections.[350] The European Asylum Support Office has also been testing Bayesian

345 Benjamin Q. Huynh and Sanjay Basu, "Forecasting Internally Displaced Population Migration Patterns in Syria and Yemen," *Disaster Medicine and Public Health Preparedness* 14, no. 3 (2019): 1, https://doi.org/10.1017/dmp.2019.73.

346 Huynh and Basu, 3.

347 Huynh and Basu, 3.

348 Disney et al., *Evaluation of Existing Migration Forecasting Methods and Models*, 21.

349 Disney et al., *Evaluation of Existing Migration Forecasting Methods and Models*, 21; Bijak et al., "Forecasting International Migration," 473.

350 Carammia and Dumont, "Can We Anticipate Future Migration Flows?," 7.

models to reduce uncertainties in their migration forecasts.[351] Their wide application in projecting future migration numbers warrants further exploration in this thesis.

The Bayesian forecasting model has been examined by researchers looking to improve migration forecasting, including Bijak, Raymer and Wiśniowski, Azose and Rafferty, and Huang and Unwin. Bijak advocates the use of Bayesian models in migration forecasting for several reasons. He observes that Bayesian modeling enables researchers to combine the beneficial features of other forecasting methods in a more formal way, as well as quantify the degree of uncertainty in each prediction.[352] The latter benefit is critical for decision-makers, who need to know how reliable a prediction is before acting or devoting resources based on a prediction. In 2019, Bijak et al. examined the accuracy of several migration forecasting models and found that for situations where no long-term historical data were available, Bayesian modeling was the only method that could produce accurate forecasts.[353] They attribute this strength to the model's ability to incorporate expert judgments into the analysis.[354]

Raymer and Wiśniowski have taken the Bayesian model one step further and used it to forecast immigration rates by age and gender. Their work acknowledges that the age of international migrants remains relatively stable, allowing forecasters to simplify their projection models and gain greater accuracy.[355] This simplification also has usefulness for the federal government, which can examine demographic indicators in originating countries to determine the number of people at the international migrating age. Similarly, Azose and Rafferty applied a fully Bayesian model to project global net migration rates

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351 Carammia and Dumont, 7.

352 Jakub Bijak, "Bayesian Methods in International Migration Forecasting," in *International Migration in Europe: Data, Models and Estimates*, ed. James Raymer and Frans Willekens (West Sussex, England: John Wiley & Sons, 2007), 253–81, https://doi.org/10.1002/9780470985557.ch12.

353 Bijak et al., "Forecasting International Migration," 477.

354 Bijak et al., 477.

355 James Raymer and Arkadiusz Wiśniowski, "Applying and Testing a Forecasting Model for Age and Sex Patterns of Immigration and Emigration," *Population Studies* 72, no. 3 (2018): 339–55, https://doi.org/10.1080/00324728.2018.1469784.

using only demographic variables.[356] The strength of this research was in its ability to give long-term migration projections without large degrees of uncertainty.[357] Their methods have proven accurate when compared to the United Nations' population data, and their ability to quantify the uncertainty in predictions is an additional strength.[358]

One disadvantage to Bayesian modeling is its computational complexity.[359] Yet Bijak maintains that such complexity can be overcome using Markov chain simulations via readily available free software to produce meaningful forecasts.[360]

3. Markov Chain Models

Markov chain models are yet another effective modeling method for migration purposes. Markovian chain models are network models that anticipate the next step an agent might take, assuming that the future is independent of the past.[361] Markov chain models hold some advantages over agent-based models in terms of efficiency. Whereas an agent-based model may require data from dozens of files and need thousands of lines of code to operate, Markov chain models can be encompassed in a single file and require fewer than 500 lines of code.[362] This simplicity results in less runtime to operate the model, and a diminished chance of error resulting from bugs in the code.[363] Moreover, Huang and Unwin used a Markov chain model to anticipate refugee movements in Burundi with greater accuracy than agent-based models alone. Their use of Markov chain models resulted in a "24% reduction in long-term prediction errors."[364]

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356 Jonathan J. Azose and Adrian E. Raftery, "Bayesian Probabilistic Projection of International Migration," *Demography* 52, no. 5 (2015): 1627–50, https://doi.org/10.1007/s13524-015-0415-0.

357 Azose and Raftery.

358 Azose and Raftery.

359 Bijak, "Bayesian Methods in International Migration Forecasting," 21.

360 Bijak, 21.

361 Joe Blitzstein, "Introducing Markov Chains," February 28, 2020, YouTube video, 4:45, https://www.youtube.com/watch?v=JHwyHIz6a8A.

362 Vincent Huang and James Unwin, "Markov Chain Models of Refugee Migration Data," ArXiv:1903.08255 (Ithaca: Cornell University, 2019), http://arxiv.org/abs/1903.08255.

363 Huang and Unwin, 16.

364 Huang and Unwin, 17.

When choosing which model to use to anticipate a migration flow, it is important to select one that best captures the data. For example, in asylum flows, researchers must select a modeling method that does not assume consistency in migration numbers. Likewise, with short-term migration data, expert opinion must be factored in to improve accuracy. Thus, it is important to select a modeling method that can factor in expert analysis and does not require long-term datasets to be accurate.[365] The model must be chosen with care, accounting for the type of migration flow and the data on hand to accurately anticipate migration flows.

4. Unused Modeling Methods

This author chose not to examine several modeling methods—including gravity models, deterministic demographic models, time-series extrapolation models, and econometric models—already in use by many developed countries to forecast migration.[366] They have some use in predicting general numbers of regular migration inflows and outflows based on past numbers, but they do not examine data based on changed policies or circumstances in originating countries and, therefore, underestimate migration shocks considerably.[367] Since the aim of this thesis is to examine ways to anticipate mass-migration flows, which by nature are migration shocks, these models are unsuitable for this thesis.

Likewise, probabilistic models of migration forecasting rely on past data to establish baseline immigration levels and then factor in expert opinion and additional variables to predict trends. For these models to be accurate, they need stable, accurate data inputs over long periods. If the underlying data are from a shorter period or include periods of shocks, these models become considerably less accurate. Therefore, these models are better suited for anticipating long-term regular migrations and not the migration types discussed in this thesis.[368]

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365 Bijak et al., "Forecasting International Migration," 482.

366 Disney et al., *Evaluation of Existing Migration Forecasting Methods and Models*, 19.

367 Disney et al., 19.

368 Disney et al.

C. CONCLUSION

This chapter took an in-depth look at the technologies that could be used to help increase the precision of mass-migration anticipation and the modeling methods that could help synthesize the information that has been identified thus far. Recall that the four challenges to strategic forecasting are data availability, issue complexity, analytic processes, and institutional constraints. This chapter sought to identify technological sources of additional data and different modeling techniques that could be used to analyze the data identified in Chapters II and III. The following chapter examines and overcomes the fourth challenge—institutional constraints.

IV. INCORPORATING STRATEGIC FORECASTING INTO THE MIGRATION PLANNING PROCESS

This thesis has examined numerous migration motivators, data points, and theories that could prove valuable in honing the accuracy of migration projections. It has explored the factors that might trigger a mass migration, the demographics of the individuals likely to migrate, and the characteristics of the paths they might take, as well as the resources and technologies the U.S. government could use to predict the number of migrants who will make the journey and when they might come. Moreover, it has analyzed possible modeling methodologies to synthesize all these data into actionable information for decision-makers. What follows is a discussion about what it will take to build the institutional capacity to do this type of work in the federal government. While the U.S. government does not have an agency dedicated solely to the future, it could look to foreign partners and smaller strategic-forecasting units in the United States to identify best practices in establishing a successful strategic foresight unit.

A. INTERNATIONAL PARTNERS

Government entities in Europe, Canada, Australia, South Korea, and New Zealand are placing a premium on strategic foresight and assessing future government challenges, including migration. For example, Canada, the Netherlands, and New Zealand use modeling to forecast migration flows and support demographic projections.[369] This section turns to international partners for inspiration on how a DHS strategic foresight unit might work.

1. Sweden, South Korea, and Canada

For starters, Sweden has a ministry of future issues, strategy, and cooperation, designed to consider long-term challenges with the goal of ensuring Sweden remains

[369] Carammia and Dumont, "Can We Anticipate Future Migration Flows?," 7.

competitive in the future.[370] Recognizing that politics and politicians tend to advocate short-term successes, the ministry of the future was developed to ensure that long-term implications and issues are never overlooked.[371] As a cabinet level position, the minister of the future is a decision-maker with access to the prime minister, empowered to work horizontally across the government to ensure others ministries incorporate long-term implications into their decision-making processes.[372] The ministry of the future collaborates with people from a wide variety of backgrounds, such as those in the business community, academia, and civilians, to include all of society's stakeholders into the process.[373]

South Korea is following suit with its ministry of science, ICT (information and communication technology), and future planning.[374] Similar to Sweden, South Korea's ministry works across the government and collaborates with leaders in research, academia, and industry to develop their goals and work to achieve them.[375] Similar to Project Evergreen, which is examined in a later section, Korea updates its roadmaps every three years to keep them relevant.[376]

Canada has the Policy Horizons Canada office, whose mandate is to examine the long-term impact of cutting-edge issues in a variety of areas.[377] Policy Horizons Canada is a government organization that conducts foresight work with the goal of ensuring Canada

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370 Alberto Mucci, "Sweden's Minister of the Future Explains How to Make Politicians Think Long-Term," VICE, November 26, 2015, https://www.vice.com/en/article/ezp4am/swedens-minister-of-the-future-explains-how-to-make-politicians-think-long-term.

371 Mucci.

372 Mucci.

373 Mucci.

374 Vinayak Dalmia, "Should Countries Have a 'Minister of Future'?," World Economic Forum, March 11, 2016, https://www.weforum.org/agenda/2016/03/should-countries-have-a-minister-of-future/.

375 "Plans and Priorities," Mission Innovation, accessed June 12, 2021, http://mission-innovation.net/our-members/republic-of-korea/plans-and-priorities/.

376 Mission Innovation.

377 Selina Chignall, "A Minister of the Future? Some Tech Experts Want a One-Stop Shop for Disruptors," *IPolitics* (blog), April 10, 2016, https://ipolitics.ca/2016/04/10/a-minister-of-the-future-some-tech-experts-want-a-one-stop-shop-for-disruptors/.

remains resilient to future changes.[378] It incorporates scenario planning and horizon scanning into its strategic foresight work and strives to improve foresight literacy across the government and among the Canadian public.[379] As with Sweden's ministry of the future, Policy Horizons Canada collaborates throughout the government and with stakeholders. Nevertheless, it does not have access to key decision-makers, instead reporting to the deputy minister of employment and social development.

2. Germany

Germany uses its strategic foresight capabilities to anticipate migration flows, and its example may lend valuable insight to the United States. First, Germany is second, only to the United States, in its popularity as a destination among international migrants.[380] Second, Germany has a well-funded strategic foresight unit under the central government and uses its foresight capacity to anticipate future international migration flows. Third, Germany, like the United States, is vulnerable to migration flash points that reduce the accuracy of simple demographic forecasting.

Germany conducts robust demographic population predictions, including for migration. As international migration is its largest area of population growth, the ability to predict the number of international migrants who will immigrate to Germany is critical for maintaining accurate demographic forecasts. To do this, Germany uses a combination of modeling and expert analysis to forecast forced migration one year ahead.[381] The German government collaborates with external stakeholders as part of its strategic foresight work, funding a non-university research group called the DeZIM Institut aimed at studying, among other things, migration and integration.[382] This institute forecasts migrations and publishes its findings to help guide decision-making in the government.

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[378] "About Us," Policy Horizons Canada, accessed June 12, 2021, https://horizons.gc.ca/en/about-us/.

[379] Policy Horizons Canada.

[380] Migration Policy Institute, "Top 25 Destinations of International Migrants."

[381] Carammia and Dumont, "Can We Anticipate Future Migration Flows?," 6.

[382] "Das DeZIM-Institut," DeZIM Institut, accessed March 20, 2021, https://www.dezim-institut.de/das-dezim-institut/.

German's strategic foresight unit predicts how many migrants will come to the country based on several key factors. First, it looks at regions where migrants are likely to originate, examining factors such as conflict and unstable political regimes.[383] This helps Germany determine which countries are likely to generate migrants seeking international protection for a period. Once such countries are identified, Germany examines their demographics to estimate the number of migrants.[384] For instance, German research indicates that people ages 20–39 are most likely to migrate, so the German unit narrows the data to people in that range to determine the maximum number of potential migrants. Then, Germany analyzes migratory push factors in those originating countries, meaning political, economic, demographic, and ecological factors that are likely to push people toward international migration.[385] Some of the key drivers examined include rapid demographic growth, high levels of unemployment, political instability, and climate change.

Next, Germany looks inward. It examines the international perception of Germany as an "economically attractive and stable country."[386] Then, the German unit looks at the country's migration policy to determine how it will encourage or discourage migrants from selecting Germany as a destination.[387] The government also considers limits on family reunification, alternative safe-destination countries, and changing migration policies in those countries to help determine whether Germany will be the migrants' eventual destination. This analysis helps the government estimate how many of the migrants will ultimately choose Germany. Importantly, Germany also anticipates what it calls "flash points," which resemble what the United States describes as shocks or black swan events. Looking at flash points is critical in mass-migration forecasting, as traditional forecasting

383 German Federal Statistical Office, *A Changing Population: Assumptions and Results of the 14th Coordinated Population Projection* (Wiesbaden: German Federal Statistical Office, 2019), https://www.destatis.de/EN/Themes/Society-Environment/Population/Population-Projection/Publications/Downloads-Population-Projection/germany-population-2060-5124206199004.html.

384 German Federal Statistical Office.

385 German Federal Statistical Office.

386 German Federal Statistical Office.

387 German Federal Statistical Office.

models that rely on demographics alone are typically upended by such events. Furthermore, Germany not only develops an understanding of migration drivers in countries of origin but also intervenes when necessary to prevent migration flows.[388] For example, Germany continues to provide millions of Euros of humanitarian aid to Syria to stem the flow of migrants from that country.[389]

This in-depth mass-migration forecasting allows Germany to know in advance where its international migrants are coming from, how many are coming, and where they are likely to enter. With this information, the Germans can respond effectively, ensuring appropriate levels of funding and sending resources to the correct locations. This ultimately helps Germany prevent humanitarian crises among its international migrant population. Germany is an excellent example of how a government can incorporate strategic foresight into its mass-migration planning processes, and the U.S. government could implement many German strategies when standing up its own strategic foresight unit.

B. THE UNITED STATES

In looking for inspiration to structure a strategic foresight unit, the United States can turn to some of its own notable future-planning departments in the federal government: the Office of Net Assessment and the Defense Advanced Research Projects Agency (DARPA) under the Department of Defense, Project Evergreen under the U.S. Coast Guard, and the Homeland Security Taskforce East under DHS.

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388 Demetrios G. Papademetriou and Kate Hooper, *Building Partnerships to Respond to the Next Decade's Migration Challenges* (Washington, DC: Migration Policy Institute, 2017), https://www.migrationpolicy.org/research/building-partnerships-respond-next-decades-migration-challenges.

389 "Humanitarian Aid in Syria," German Federal Foreign Office, April 2, 2020, https://www.auswaertiges-amt.de/en/aussenpolitik/laenderinformationen/syrien-node/humanitarian-aid-syria/2303604.

1. Department of Defense

> In a capital that can be preoccupied with winning the day or kicking the can, the Pentagon needs an office pursuing many areas of interest with a long-range view.
>
> —Jan Van Tol[390]

The Office of Net Assessment is tasked with providing long-term comparative assessments of trends, risks, opportunities, and prospects for the U.S. military.[391] It also conduct studies and research that anticipate the future of warfare to guide the National Defense Strategy and ensure the U.S. military is ready for any challenge the future holds.[392]

Two critical factors contribute to the Office of Net Assessment's success: autonomy and access to key decision-makers.[393] The autonomy of the Office of Net Assessment is critical to its proper functioning. It is insulated from the day-to-day crises that plague other departments in Washington, DC, thus allowing it to remain laser-focused on its key mission, anticipating future threats to the United States.[394] Moreover, its access to key decision-makers, particularly the secretary of defense, is critical to ensuring swift action against future threats.[395]

DARPA, the other defense entity focused on the future, has one mission: "to make pivotal investments in breakthrough technologies for national security."[396] DARPA has

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390 Philip Ewing, "Secrets of a Pentagon Think Tank," Politico, March 12, 2014, https://www.politico.com/story/2014/03/office-of-net-assessment-pentagon-104591. Van Tol is a retired Navy captain and former military assistant to the Office of Net Assessment.

391 "Office of Net Assessment," Department of Defense, accessed May 22, 2021, https://www.defense.gov/Our-Story/Office-of-the-Secretary-of-Defense/Office-of-Net-Assessment/.

392 Department of Defense.

393 Ewing, "Secrets of a Pentagon Think Tank."

394 Ewing.

395 Department of Defense, *Director of Net Assessment*, DoD Directive 5111.11 (Washington, DC: Department of Defense, 2020), https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodd/511111p.pdf; Erik J. Dahl, *Intelligence and Surprise Attack: Failure and Success from Pearl Harbor to 9/11 and Beyond* (Washington, DC: Georgetown University Press, 2013).

396 "About DARPA," Defense Advanced Research Projects Agency, accessed June 6, 2021, https://www.darpa.mil/about-us/about-darpa.

made huge technological contributions to society, and it is responsible for such breakout technologies as the internet, stealth technology, and automated voice recognition.[397] Its contributions ensure that the U.S. military anticipates and remains at the cutting edge of new technology.

DARPA benefits from several opportunities that contribute to its success. First, it works closely with military, public and private-sector innovators, recruiting the best individuals to work on its teams. It also benefits from exclusive hiring authority to recruit people from the private sector for three- to five-year terms to complete special projects. Furthermore, its three-month fellowship program allows military and civilian employees to work on cutting-edge technology for the Department of Defense.[398] By investing heavily in recruitment and stressing close collaboration between the private, military, academic, and public sectors, DARPA can get the best minds in the country in the same room, working together to solve big problems. Imagine what could be accomplished if DHS adopted a similar collaborative structure aimed at building the capability to anticipate mass migrations.

2. U.S. Coast Guard

> It is not enough to be a world-class responder anymore; the Coast Guard needs to become a world-class anticipator as well.
>
> —U.S. Coast Guard[399]

The Coast Guard has also recognized the importance of incorporating strategic foresight into its repertoire, specifically in its Project Evergreen, which oversees horizon scanning and scenario planning. This program involves a continuous process for strategic development and renewal, as well as strives to embed this strategic intent throughout the

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397 Defense Advanced Research Projects Agency.

398 "Service Chiefs Fellows Program," Defense Advanced Research Projects Agency, accessed June 12, 2021, https://www.darpa.mil/work-with-us/for-government-and-Military/service-chiefs.

399 U.S. Coast Guard, *Creating and Sustaining Strategic Intent in the Coast Guard: U.S. Coast Guard Evergreen Process* (Washington, DC: U.S. Coast Guard, 2005), https://www.uscg.mil/Portals/0/Strategy/Report%20Evergreen%20I.pdf.

Coast Guard's ranks.[400] Working with stakeholders, it identifies potential challenges and develops a plan to meet them head-on. It also seeks input from a diverse spectrum of ranks and disciplines, both within the Coast Guard and among its private-sector stakeholders, to paint an accurate picture of the challenges facing the organization and the means of mitigating them. This important step in the process also serves to increase buy-in for Project Evergreen from the Coast Guard's ranks.

Project Evergreen is especially impressive because it aligns its strategic work with the terms of incoming commandants, in four-year cycles. Such a scheme allows the project to incorporate the commandant's ideas and goals into the planning cycle, a critical step in maintaining buy-in from the Coast Guard's key decision-maker (see Figure 12 and 13).

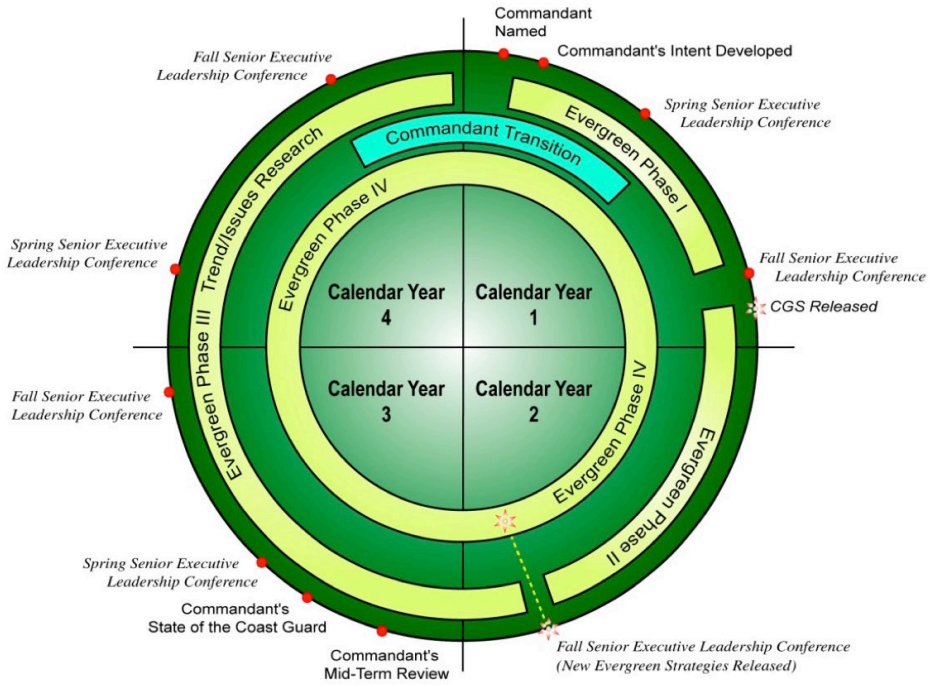

Figure 12. U.S. Coast Guard Cycle of Strategic Renewal[401]

400 U.S. Coast Guard, *Evergreen II Project Report* (Washington, DC: U.S. Coast Guard, 2009), https://www.uscg.mil/Portals/0/Strategy/Report%20Evergreen%20II%20Project.pdf.

401 Source: U.S. Coast Guard, *Evergreen II Project Report*, 10.

While U.S. immigration authorities are at a disadvantage in that the secretary of homeland security does not have a standing four-year term, secretaries are appointed by the president of the United States, who serves for four years. Therefore, this cyclical forecasting strategy could be incorporated into a strategic foresight unit and timed to align with presidential terms, thus incorporating administration goals and intentions.

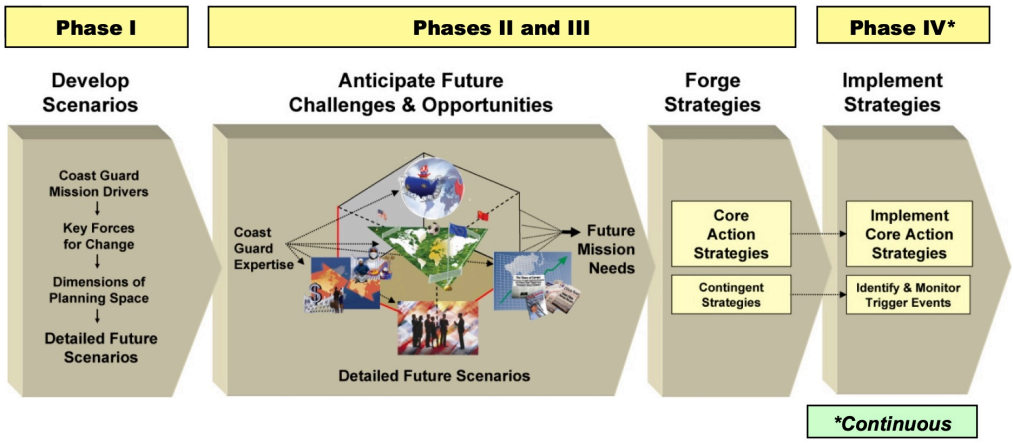

Figure 13. Phases of Project Evergreen[402]

While military at its roots, the Coast Guard currently falls under DHS, thus demonstrating that strategic foresight activities can be achieved within the DHS environment. It is an excellent example for other homeland security entities to follow.

3. Homeland Security Task Force Southeast

Perhaps the best and most closely related example of strategic forecasting is the Homeland Security Task Force Southeast, which already conducts scenario planning for mass migrations through the Caribbean. It employs an early-warning system that includes set parameters for activation and access to resources absent a mass-migration declaration. Task Force Southeast has been so successful that recent triggering events in Caribbean

402 Source: U.S. Coast Guard, *Evergreen II Project Report*, 11.

nations, such as earthquakes in Haiti and communist dissident crack-downs in Cuba, have not generated a mass maritime migration event. Instead, Caribbean migrants like Haitians and Cubans are increasingly choosing to immigrate by land through the southwest border.[403] Task Force Southeast is a successful example of mass-migration anticipation that U.S. immigration authorities could strive to emulate along the southwest border.

C. SOUNDING THE ALARM

With all these resources available, and with a successful migration anticipation unit operating in the Caribbean, why does the United States continue to be surprised by mass-migration events along the southwest border? Why is there no Paul Revere of the immigration world, sounding the alarm that migrants are coming? Answering these questions requires analyzing institutional barriers to anticipating mass-migration events along the southwest border. The first limitation relates to the natural land border. The second is the number of commanding officers who must collaborate—the Caribbean has far fewer than the southwest border. The third involves the authority granted to each controlling entity.

The land border is a difficult environment to track migrants. While Task Force Southeast can operate in international waters to intercept migrants before they arrive in the United States, immigration authorities along the southwest border have no such luxury. There is no international area to interdict migrants before their arrival in the United States. Land on the other side of the southwest border is the sovereign territory of Mexico, so conducting immigration work there without the express permission of the Mexican government would violate its sovereignty. Thus, if U.S. immigration authorities want to intercept migrants before they arrive at the southwest border, they must collaborate and negotiate with Mexican and Central American governments. Unsurprisingly, these governments are often hesitant to assist with such efforts—the expense is massive, and governments have little incentive to cooperate with the U.S. government. These constraints

[403] Terry, "New Haitian Migration Patterns End in Displacement"; Nick Miroff, "As Migrants Arrive from More Nations, Their Paths to U.S. Border Diverge, New Data Show," *Washington Post*, July 6, 2021, https://www.washingtonpost.com/national/migrant-routes-border-mexico/2021/07/06/baa23c2c-db49-11eb-ae62-2d07d7df83bd_story.html.

prevent U.S. immigration authorities from engaging in the more-proactive activities enjoyed by Task Force Southeast.

Another institutional constraint at the southwest border relates to geographic proximity and the number of controlling officials who must collaborate during a mass-migration event. Control of the U.S. southeast maritime border typically involves representatives from each agency from Florida or possibly the Caribbean—in other words, one Coast Guard commandant, one ICE enforcement and removal director, one Homeland Security Investigations special agent in charge, one Border Patrol chief, one CBP Office of Field Operations director, and one CBP air and marine director. This arrangement means that a handful of people, who are proximate geographically, can easily meet to devise a plan to address a mass-migration flow.

In contrast, controlling agency directors along the southwest border are plentiful and spread far apart. The southwest border spans four states and approximately 1,933 miles.[404] It encompasses several areas of responsibility for several agencies, and each area of responsibility has its own agency director—an arrangement that dramatically increases the complexity and amount of collaboration needed to plan and respond to mass-migration events. For example, along the southwest border, there are nine Border Patrol sectors, each with a Border Patrol chief in control; four CBP Office of Field Operations areas of responsibility, each with its own director; five ICE Enforcement and Removal Operations field offices, each with its own field office director; and six Homeland Security Investigations special agents in charge.[405] These numbers do not even account for CBP Air and Marine Operations, the Coast Guard, or CIS offices that must be involved. Each agency director controls the territory and resources within her area of responsibility yet works in tandem with other directors to ensure swift and efficient border operations. Given

404 Janice Cheryl Beaver, *U.S. International Borders: Brief Facts*, CRS Report No. RS21729 (Washington, DC: Congressional Research Service, 2006), https://fas.org/sgp/crs/misc/RS21729.pdf.

405 "Border Patrol Sectors," Customs and Border Protection, accessed July 17, 2021, https://www.cbp.gov/border-security/along-us-borders/border-patrol-sectors; "Southwest Land Border Encounters (by Component)," Customs and Border Protection, August 12, 2021, https://www.cbp.gov/newsroom/stats/southwest-land-border-encounters-by-component; "ICE Field Offices," Immigration and Customs Enforcement, accessed July 17, 2021, https://www.ice.gov/contact/field-offices.

the sheer number of different agencies and people who must collaborate at the southwest border, not to mention the geographic distance between them, it is obvious how difficult preparing for and responding to a mass migration can be.

Furthermore, the lack of authority to respond is a significant institutional constraint along the southwest border. The former Joint Task Force West, disbanded in 2020, had to wait for a mass-migration declaration to activate, thus relegating it to a reactionary stance.[406] Until a mass migration was declared, it could not assume command and control nor access the resources to prepare a response. In the United States, the authority to declare a mass migration rests solely with the president or the secretary of homeland security. Resting the authority with such high-ranking officials caused unnecessary delays and prevented Joint Task Force West from operating with foresight.

Unsurprisingly, given the vast people from each agency who had to collaborate and share resources during a mass migration, the task force was plagued with bureaucratic in-fighting.[407] Without a mass-migration declaration, there was no command system in place to compel individual immigration entities to share resources. Given these constraints, it is no wonder that Joint Task Force West was limited in its ability to anticipate and respond to mass-migration events. Over time, lacking the ability to respond meaningfully to mass-migration events, the focus of the task force was steered toward combatting terrorism and drug trafficking. While worthy causes, this shift in focus meant no group remained to anticipate mass-migration flows.

Another institutional constraint along the southwest border relates to communication flow. With the number of agencies involved in mass migrations, maintaining effective communication channels is challenging. Currently, ICE's International Operations section is overseen by Homeland Security Investigations, whose mission is to "investigate, disrupt and dismantle terrorist, transnational and other criminal organizations that threaten or seek to exploit the customs and immigration laws of the

406 Giaritelli, "DHS Secretly Shuttered Obama-Era Task Force."

407 Giaritelli.

United States."[408] Its mission does not involve managing mass-migration flows—that responsibility falls to ICE's Enforcement and Removal Operations (ERO). Yet the International Operations office for ICE is managed by Homeland Security Investigations, which has officers stationed in 11 offices throughout Mexico and Central America.[409] These officers observe the in-country circumstances in real time. However, the communication flow of this information is not as clear-cut as it could be. As Homeland Security Investigations is not typically affected by mass-migration flows, its officers are not necessarily interested in them, nor do they relay information that could be useful to ERO in terms of preparation.

Even when officers from ERO—the section of ICE charged with handling migration flows—are situated in Central American countries, their chain of command flows through Homeland Security Investigations. Relaying communication through an entity not involved in the mass-migration planning or response process can prevent information from reaching the people who need it.

D. CONCLUSION

To avoid making past mistakes, U.S. immigration officials should look to Homeland Security Task Force Southeast, other departments within the government, and other countries' governments that already conduct strategic-forecasting work. The goal should be to examine other strategic foresight groups within government with an eye toward adopting best practices. While mostly within the military sphere, U.S. immigration authorities have multiple examples of successful strategic foresight units from within the government. DHS could strive to replicate the successes of Task Force Southeast, the Office of Net Assessment, DARPA, and Project Evergreen to ensure readiness for future mass-migration events along the southwest border.

In examining the way other entities conduct strategic forecasting, several relevant themes emerged for structuring a strategic foresight unit. First, such units collaborate

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408 "Homeland Security Investigations," Immigration and Customs Enforcement, accessed July 18, 2021, https://www.ice.gov/about-ice/homeland-security-investigations.

409 Immigration and Customs Enforcement.

horizontally across the government and with external stakeholders to improve accuracy and keep foresight at the front of people's minds. Second, such units have direct access to decision-makers able to act quickly on their recommendations. Third, the units operate with relative autonomy—the freedom from responding to today's crises allows them to focus on the future. All these factors could be implemented in an American strategic foresight unit. The final chapter discusses how to overcome institutional constraints and build the institutional capacity to do strategic foresight work in the mass-migration arena.

V. CONCLUSIONS AND RECOMMENDATIONS

This thesis has examined a variety of migration motivators, data points, and theories that could prove valuable in honing the accuracy of migration projections. It has also discussed ways to overcome the four challenges to strategic forecasting within the migration context. Chapter II introduced the push-path-pull theory and Maslow's hierarchy of needs as a framework for looking at the myriad reasons people migrate. Looking at the drivers of migration through the lens of unmet needs in the populace is a way to simplify this issue, thus addressing the first challenge of strategic foresight—complexity.

Chapters II and III addressed how to overcome the challenge of data availability. It first introduced data sources for quantifying push and pull factors. Next, it identified some technologies that could serve as additional data points and others that could enhance the precision of migration anticipation data.

The next chapters sought to overcome the analytic process challenge. Chapter III discussed modeling methods that could be used to analyze the identified data sources, and Chapter IV examined ways that other agencies and governments have integrated strategic foresight work to get ahead of major issues. Then, best practices were identified that could be incorporated into a strategic foresight unit here in the United States. Finally, the chapter addressed institutional constraints that have prevented prior mass-migration anticipation units from being successful along the southwest border.

This final chapter explores how the United States government could overcome institutional constraints to establish and run its own strategic foresight unit aimed at anticipating mass-migration flows.

A. POLICY RECOMMENDATIONS

1. Establish a strategic foresight unit within DHS, tasked with anticipating mass migrations to the United States.

The secretary of homeland security should create a strategic foresight unit, tasked with mass-migration anticipation, and direct entities within DHS such as CIS, ICE, CBP,

the Border Patrol, and the Federal Emergency Management Agency (FEMA) to send representatives from each agency to participate. The secretary should also request representatives from agencies outside DHS, including but not limited to the ORR, the Department of State, the U.S. Census Bureau, and the U.S. Agency for International Development. These representatives should have expertise in country conditions, migration modeling, demographics, or international aid.

The strategic foresight unit should have the ability to conduct migration modeling in house or be empowered to coordinate with outside entities such as research institutes or universities to gain the expertise needed. It should also perform continuous scenario planning, timed to align with presidential election cycles, and produce a report at least every four years identifying migration trends, establishing the most likely countries from which a mass migration would originate, and updating thresholds for triggering events.

This strategic foresight unit should build out an early-warning system for mass-migration events, establishing thresholds and activating specific responses once such thresholds are met, as the Task Force Southeast does with its Maritime Migration Plan. One of the predetermined responses should include activation of a command structure empowered to direct all immigration resources along the southwest border during a mass-migration event. Another predetermined response should trigger resources to originating countries with the goal of alleviating mass-migration stressors.

The strategic foresight unit should be given a high degree of autonomy and empowered to work across the government and with external stakeholders to ensure it has access to the best minds possible. Ideally, it would be given the flexibility to collaborate with the private sector, the public sector, and academia, among others. Moreover, the strategic foresight unit should maintain swift access to decision-makers. As mass migrations can be triggered rapidly, the mass-migration team will need access to decision-makers with the capability and financial access to deploy resources quickly to prevent or respond to mass-migration events. Furthermore, the unit should establish and maintain clear communication flows with U.S. immigration authorities to ensure that all relevant immigration stakeholders throughout the government are privy to the same information in real time.

2. Delegate the authority to declare a mass migration to the lowest level possible to expedite deployment of resources to the southwest border and to originating countries in anticipation of a mass-migration event.

The secretary of homeland security, in consultation with the strategic foresight unit, should establish clear thresholds for declaring a mass-migration event. Preferably, such a declaration would occur once preestablished migration thresholds are met, independent of the need for a politician or political appointee to make the declaration. Such a declaration should trigger an operational response unit to activate and assume command and control of the mass-migration event.

3. Establish an operational response unit for mass migrations along the southwest border.

The secretary of homeland security should authorize the creation of a mass-migration operational response unit that assumes command and control of the southwest border in the event of a mass migration. This operational response unit should comprise leaders within all agencies involved with the mass-migration event, including CBP, ICE, the ORR, CIS, and FEMA. However, command and control should be clearly established so that agencies know they must obey orders and send resources as instructed by the operational response unit. Furthermore, this unit will need access to funding for a whole-of-government approach to the mass-migration event.

4. Establish appropriate funding mechanisms for the strategic foresight unit and mass-migration operational response unit.

For these units to be effective, the following funding mechanisms are recommended. First, establish a mechanism for DHS funding to be funneled to the U.S. Agency for International Development or the Department of State to prevent or alleviate flash points likely to trigger mass-migration flows. Like Germany's deployment of resources to prevent a mass-migration flow, the strategic foresight unit, or a key decision-maker, ought to have access to these funds to prevent mass migrations. Second, establish a funding mechanism independent of individual agency resources that could be used by the strategic foresight unit and the operational response unit to deploy resources to the border

in anticipation of and response to a mass-migration event. Third, establish funding for grants and temporary assignments to the strategic foresight unit. For the unit to have access to the best technology and talent available, a funding mechanism like DARPA's should supply grants in support of the strategic foresight unit or temporary assignments of individuals to it.

B. IMPLEMENTATION PLAN

To implement the recommendations in this thesis, the secretary of homeland security should establish a strategic foresight unit within DHS specifically tasked with anticipating mass-migration flows. It is also recommended that the secretary direct all agencies involved in immigration or emergency management to send representatives to the strategic foresight unit to fulfill its goals. This would include ICE, CBP, the Border Patrol, CIS, and FEMA. The reason for directing instead of requesting these agencies is that the last time such as coordinated group was convened, it was plagued by bureaucratic in-fighting that prevented its work. Directing these agencies to participate and requiring them to send representatives with access to decision-makers will demonstrate the secretary's support of this program and signal that supporting agencies should devote adequate time and resources to this endeavor.

The secretary of homeland security should also coordinate with the Department of State, the Department of Health and Human Services, the U.S. Census Bureau, and the U.S. Agency for International Development to gain their support and representation in this unit. The U.S. Census Bureau would be helpful because it currently predicts international migration levels. The U.S. Agency for International Development would be helpful because it already has funding and in-country representatives tasked with humanitarian aid efforts. Through this partnership, DHS could have a mechanism to direct funding for humanitarian aid through already established relief mechanisms. Furthermore, the Department of State needs representation in this unit because it is tasked with knowing the conditions in foreign nations.

The strategic foresight unit should comprise a cross section of specialties such as demographers, data analysts, computer scientists, and experts in country conditions. It

should work closely with the military, the Department of State, the intelligence sector, the academic community, and public- and private-sector innovators. In an ideal world, this unit would operate similarly to DARPA and have access to special hiring authorities that would allow it to recruit people from the private sector to complete special projects, such as creating or updating migration models. It would also benefit from access to grant money in allowing it to partner with and support private-sector or university programs already doing mass-migration anticipation work. Ideally, it would also have a fellowship program whereby military and civilian employees could spend several months working for the strategic foresight unit working on cutting-edge technology for mass-migration anticipation.

For the strategic foresight unit to access the best information possible in forecasting migration trends, it should be privy to real-time country condition reports from the Department of State and the U.S. Agency for International Development and demographic data from the U.S. Census Bureau. The strategic foresight unit should also have access to satellite data such as those produced by the Department of Agriculture, the National Oceanic and Atmospheric Administration, and the National Reconnaissance Office so that it can monitor food, water, and climatic conditions that could trigger a mass migration. Access to these data is necessary for accurate migration forecasts.

The secretary of homeland security should direct the strategic foresight unit to devise a comprehensive plan to anticipate mass-migration events. This comprehensive plan should include, at a minimum, a cyclical scenario-planning process and an early-warning system. The strategic foresight unit should be directed to write a report at least every four years with updated migration forecasts. Ideally, this cyclical scenario-planning process and report would align with presidential terms, so the incoming president's objectives can be addressed in the paper, thus allowing for greater buy-in from and access to the nation's key decision-maker. This product would be similar to *The Future of Migration to Germany*, a report written by the DeZIM Institut. The purpose of this report would be to inform decision-makers about where mass migrations are likely to originate and how many migrants the U.S. government is likely to see. This report will help guide planning, resource

allocation, and foreign aid, as finances could be directed toward addressing migration stressors, hopefully defusing a potential mass migration before it occurs.

Once the mass-migration team is assembled and access to key data metrics obtained, the strategic foresight unit should begin building out the capacity to forecast mass-migration events by establishing a horizon-scanning process and developing a mass-migration early-warning system. In building out this capacity, the strategic foresight unit should first work to determine the countries most susceptible to a mass-migration exodus. Given that most irregular migrants to the United States originate from the Northern Triangle countries of Mexico, Honduras, El Salvador, and Guatemala, this author posits that the U.S. government should first concentrate forecasting efforts there. But the United States should continue to monitor, through its horizon-scanning process, other regions that might produce significant quantities of migrants. Significant events in any countries with paths to the United States warrant additional consideration by the strategic foresight unit. For example, events such as the Haitian president's assassination should trigger the strategic foresight unit to begin monitoring metrics and evaluating the potential for a mass migration from Haiti.

Once the likely countries for mass migration are established, the United States should work to identify the key drivers of international migration in those areas, applying Maslow's hierarchy as a framework for identifying unmet needs in the populace. Additionally, technological resources should be utilized, such as internet queries and satellite imagery, as discussed in Chapter III. Once the key drivers have been identified, the United States should establish metrics for monitoring them with the aim of detecting migration stressors that reach their breaking points and intervening when necessary to prevent mass-migration flows.[410]

In addition to examining key drivers of migration, the U.S. government should also examine flash points in countries with a path to the United States to determine which events in those countries might trigger mass migrations. For example, Guatemala both produces many migrants to the United States and appears among the top 10 countries most at risk

[410] Papademetriou and Hooper, *Building Partnerships to Respond*, 48.

from climate change.[411] Climate change threatens food and water sources in Guatemala, so these stressors could lead to international migration.[412] Therefore, the strategic foresight unit could remotely monitor crop yields and water levels in Guatemala using satellite technology already in use in other government agencies to aid its migration forecasting efforts in Guatemala.

Once stressors and flash points are identified, the strategic foresight unit should explore ways to utilize technology to monitor such stressors. The unit should apply relevant technologies that can improve the accuracy of mass-migration anticipation and decide which modeling methods to use to synthesize this information. Once the countries, stressors, trigger points, and likely number of migrants are identified, the strategic foresight unit could select the data points it wants to examine, choose an appropriate modeling method, and begin the process of conducting migration modeling. However, migration modeling should be an iterative process that is continually updated and even migrated over to other modeling methods when necessary.

Then, the U.S. government should examine demographics of countries at risk to narrow down the number of people likely to migrate to the United States. The mass-migration team could coordinate with the intelligence sector, the Department of State's country condition experts, and any other relevant agencies to keep its finger on the pulse of potential triggers. The unit should also stay current on issues within those countries to modify the trigger points with current events. Thus, the capacity to work across governments is critical to the success of the strategic foresight unit. Any number of U.S. agencies have a nexus to mass migrations. If the strategic foresight unit decides that wage inequality is a key driver of migration in a particular country, it may need to work with the Department of Labor to learn about changes in that area or receive key insights to drive its modeling. Likewise, if the unit discovers that a country's most-likely migration trigger

411 "Latin America: Guatemala," Research Program on Climate Change, Agriculture and Food Security, accessed March 20, 2021, https://ccafs.cgiar.org/regions/latin-america/guatemala.

412 Research Program on Climate Change, Agriculture and Food Security; Johnson, "Using Maslow's Hierarchy of Needs."

point is hurricane, the unit may need access to updated weather reports from the National Oceanic and Atmospheric Administration or the National Weather Service.

The strategic foresight unit should be empowered to work with other agencies or use other forecasting tools as appropriate. It may choose to send out surveys to experts throughout the government and in the private sector using the Delphi method, conduct analysis within a broader scope of countries, or begin analyzing social-media data. The important thing is that the unit is given the freedom and autonomy to conduct its migration foresight activities as it sees fit, free from political pressure and unburdened from the day-to-day crises that plague other government units.

The strategic foresight unit should share its findings in a report published at least every four years and in memoranda to decision-makers and other government agencies as needed in response to potential shock events. Clear communication pathways should be established between the strategic foresight unit and agencies involved in mass-migration anticipation and planning. Such information should be shared with U.S. immigration authorities, as well as the Department of State and the U.S. Agency for International Development, to aid in foreign assistance distributions with the goal of improving the countries' resilience to flash points. Ideally, alleviating migration flash points could prevent mass migration to the United States.

Once the strategic foresight unit is operational, it should begin a continuous process of monitoring migration stressors. It should use its models as well as access to other information to monitor migration stressors in identified countries so that it can establish baseline and escalated rates. It should also establish an early-warning system with thresholds for triggering responses. Once migration stressors begin to escalate, the unit should notify key decision-makers so they can decide whether to deploy humanitarian aid to assist in meeting the country's needs. This information should also be communicated throughout U.S. immigration agencies, so they can prepare to deploy resources to the southwest border. At this point, the United States should coordinate with the U.S. Agency for International Development and the Department of State to increase funding and in-country response efforts to alleviate humanitarian crises and reduce migration stressors.

Such interventions, delivered at the correct time, could prevent a mass migration from occurring in the first place.

Once triggering events begin to occur, the strategic foresight unit should also recommend that decision-makers mobilize an operational response unit to assume command and control over the mass migration. This operational response unit should comprise leaders within all agencies involved with the mass-migration event, including CBP, ICE, ORR, CIS, and FEMA. Command and control of the operational response unit should be clearly established and communicated so that agencies know they must obey orders and send resources as instructed by the operational response unit. The operational response unit will need access to funding to respond with a whole-of-government approach to mass-migration events. This will prevent the resource scarcity mindset that has caused interagency disputes in the past. This unit should begin building up capacity and sending resources to the border to respond to the mass-migration event and ensure a humanitarian crisis does not occur.

It is paramount that U.S. immigration authorities work in tandem to prepare and respond to mass-migration events. Each agency has a unique role to play in addressing migrant flows, and the failure of even one entity to respond quickly can cause delays for all other agencies, not to mention delay processing times for migrants. This was demonstrated during the mass migration of the 2010s when a lack of detention space for family units and unaccompanied minors within the ICE and ORR network backed up the entire immigration system. Not having a consolidated command structure to prepare and respond to mass-migration events prevents U.S. immigration authorities from responding in a coordinated, efficient way. With the large number of government entities tasked to respond to a mass-migration event, it is paramount that such agencies work together seamlessly. Establishing a mass-migration operational response unit, similar to Homeland Security Task Force Southeast, with clear command and control and access to resources is critical for mounting a timely and effective mass-migration response.

Once activated, the operational response unit can take over and begin monitoring migration flows. As the migrants begin traveling, the unit can utilize available technology, like internet queries, to gauge the likelihood of a mass-migration event. At this point,

communication with officials in country is critical so that the operational response unit can confirm whether sources on the ground are seeing the same thing that the data show. While the operational unit can be guided by and benefit from the groundwork laid by the strategic foresight unit, at this point, the strategic foresight unit hands off command and control of the event to the operational response unit. The strategic foresight unit should hand off control to the operational response unit because the former should always remain free to focus on strategic foresight and horizon scanning. If the unit must respond to current events, it will have to divert attention away from future planning, potentially missing the next threat on the horizon. Its vision should remain laser-focused on the future so that U.S. immigration authorities are not surprised by the next mass-migration event.

By adopting this whole-of-government approach to mass-migration anticipation, the U.S. government can shift from a reactionary to an anticipatory stance in terms of mass-migration planning. By knowing when, where, and how many migrants are likely to come, the U.S. government can be prepared for mass migrations at the southern border and hopefully take steps to prevent them from happening. By conducting real-time analysis to anticipate mass migrations before they occur, and swiftly responding if they do, the U.S. government can prevent humanitarian crises at the southwest border.

C. FUTURE RESEARCH

One surprising thing this author found is that much of the research on immigration has been done in a vacuum. It seems that many of the researchers conducting this work are doing so within the very rigid parameters of their respective fields. A host of people have looked at this problem from a sociological perspective, from a demographic perspective, from the economics of migration, and from computer science, trying to create models to simulate these effects. Mass migration is a huge and complicated topic. It must be examined and addressed in a multi-disciplinary way if it is going to grasp the multitude of reasons people migrate. And it must be done in such a way that practitioners working to manage mass-migration events and the migrants themselves can benefit from it.

One way to address the myriad disciplines in this study is to establish an independent mass-migration research entity or anticipation center within a university. This

center could partner with government entities, academia, and humanitarian organizations to address this important topic from a variety of perspectives. It could also serve as a funnel for information that can affect mass-migration flows. This mass-migration anticipation center could be a secondary option in case the government decides that creating a strategic foresight unit within DHS is too daunting a task. This would prevent the need to hire a substantial number of mass-migration analysts, data scientists, computer scientists, and demographers within the federal government. Instead, the U.S. government could offer grants to pay for this private research with the understanding that the data need to be shared with the government for use by U.S. immigration authorities.

Ideally, employees of this center could be granted access to the same reports and access to government resources that the strategic foresight unit would be given, including country condition reports, intelligence reports, demographic information from the Social Security Administration, economic information from the Treasury and Labor departments, disease information from the Centers for Disease Control and Prevention, and all other information relating to mass-migration flows.

This thesis has covered much ground, but I hope to demonstrate, more than anything, that anticipating mass-migration flows is possible and worth doing. The United States cannot continue to be surprised by mass-migration events at the southwest border. We cannot continue to allow mass migrations to turn into humanitarian crises. Conducting mass-migration foresight is going to be a colossal task, but the stakes are too high not to act. This is good work that is worth doing.

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